The Department of Defense

DoD DEPARTMENTS/AGENCIES:

Department of the Army

Department of the Navy

Department of the Air Force

Defense Advanced Research Projects Agency

Defense Nuclear Agency

Strategic Defense Initiative Organization

DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)

VOLUME II
NAVY
ABSTRACTS OF PHASE I AWARDS

(1)

VOLUME II

NAVY PROJECTS

ABSTRACTS OF PHASE I AWARDS

FROM

FY 1987 SBIR SOLICITATION

88 9 15 025

INTRODUCTION

On July 22, 1982 the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219). This law became effective October 1, 1982 and was designed to give small high technology firms a greater share of Federal R&D contract awards.

The SBIR Program consists of three distinct phases. Under Phase I, DoD Components make awards to small businesses, typically of one-half to one man-year effort over a period generally not to exceed six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted in response to SBIR topics. All DoD topics address specific R&D needs to improve our defense posture. Proposals selected for contract award are those which contain an approach or idea that holds promise to provide an answer to the specific problem addressed in the topic. The successful completion of Phase I is a pre-requisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. In addition, proposals which identify a follow-on Phase III funding commitment from non-Federal sources will be given special consideration. Phase II awards will typically cover two to five man-years of effort over a period generally not to exceed 24 months, also subject to negotiation. The number of Phase II awards will depend upon the success rate of the Phase I effort and availability of funds. Phase II is the principal research or research and development effort, and will require a more comprehensive proposal which outlines the intended effort in detail.

Phase III is expected to involve private-sector investment and support for any necessary development that will bring an innovation to the marketplace. Also, under Phase III, DoD may award follow-on contracts not funded by the SBIR Program for products or processes meeting DoD mission needs.

Selection Criteria

Phase I proposals received in each topic area in the DoD solicitation brochure are evaluated on a competitive basis in the organization which generated the topic, by scientists and engineers knowledgeable in that area and in accordance with the following criteria:

1. The scientific/technical quality of the research proposal and its relevance to the topic description, with special emphasis on its innovation and originality.

2. Qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available or obtainable instrumentation and facilities.

3. Anticipated benefits of the research to the total DoD research and development effort.

4. Adequacy of the Phase I proposed effort to show progress toward demonstrating the feasibility of the concept.

The Act mandates that all Federal Agencies establish an SBIR program if their FY 1982 extramural budgets for R&D exceeded a threshold figure of $100 million. Beginning in FY 1983, DoD must make available the following percentages of its extramural R&D budget for this program:

	FY 1983	FY 1984	FY 1985	FY 1986	FY 1987	FY 1988
Percentage	0.1	0.3	0.5	1.0	1.25	1.25
Estimated Dollars	16.7M	43M	79M	150M	202M	221M
Actual Awarded Dollars	20.6M	44.6M	78.2M	150.7M	202M	

FY 1983 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	182	1121	98	45
Navy	131	944	66	45
Air Force	75	496	99	49
DARPA	8	128	12	8
DNA	10	88	8	2
	406	2777	283	149

1984 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	111	758	81	35
Navy	146	859	99	52
Air Force	283	1208	162	73
DARPA	17	107	15	7
DNA	8	80	12	1
	565	3012	369	168

FY 1985 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	111	808	124	69
Navy	138	851	110	58
Air Force	218	1306	249	119
DARPA	17	130	14	6
DNA	7	95	18	6
SDIO	18	415	36	16
	509	3605	551	274

FY 1986 Program

	Number of Topics	Proposals Received	Phase I Awards	Phase II Awards
Army	225	1643	245	77
Navy	190	1222	225	81
Air Force	304	1795	306	132
DARPA	22	177	44	11
DNA	7	171	46	8
SDIO	12	552	154	38
	760	5560	1020	347

Public Law 99-443, the "Small Business Innovation Act of 1986" was signed by the President on October 6, 1986. This law re-authorized P.L. 97-219 to extend the "Sunset Clause" to 1993; to continue 1.25 percent taxation of the extramural research and development budget; and excludes from taxation those amounts of the DoD research and development budget obligated solely for operational systems development.

SUBMITTED BY

A.I. TECHNOLOGY INC
PO BOX 3081
PRINCETON, NJ 08543
CONTRACT NUMBER: N00164-87-C-0232
DR LOUIS M LEUNG
TITLE:
POLYIMIDE QUARTZ MULTILAYER BOARD
TOPIC# 182 OFFICE: NWSC/SSPO

A POLYIMIDE BASED POLYMER ALLOY IS PROPOSED TO BE USED AS THE MATRIX FOR A QUARTZ FILLED MULTILAYER CIRCUIT BOARD. POLYIMIDE WHICH HAS THERMAL EXPANSION COEFFICIENT (TEC) OF 30 ppm/DEG C IS SUBSTANTIATLY LOWER THAN THAT OF EPOXY (50-60 ppm/ DEG C). THE POLYMER ALLOY WHICH CONSISTS OF RIGID-RODLIKE MOLECULES, HOWEVER, WILL HAVE TEC AS LOW AS 10-20 ppm/DEG C. QUARTZ FIBER FILLED IN DIFFERENT GEOMETRIC ARRANGEMENTS AS WELL AS QUARTZ POWDER AND FLAKE WILL BE STUDIED FOR THEIR EFFECTS ON TEC OF THE MULTILAYER BOARD. EMPHASIS WILL BE ON THE FABRICATION PROCEDURES. THERMOPLASTIC POLYIMIDE (TPI) BASED ALLOYS CAN BE PROCESSED USING CASTING, EXTRUSION, AND MODELING TECHNIQUES. THERMOSET POLYIMIDE BASED ALLOYS CAN BE PROCESSED USING THE SAME TECHNOLOGY DEVELOPED FOR EPOXY. METHODS TO IMPROVE MOISTURE RESISTANCE, THERMAL CONDUCTIVITY, AND MECHANICAL PROPERTIES ARE ALSO DISCUSSED.

ABARIS
125 CATRON DR
RENO, NV 89512
CONTRACT NUMBER:
WILLIAM L MURPHY
TITLE:
EXPERT SYSTEM FOR IMPROVED MAINTENANCE AIDING
TOPIC# 46 OFFICE: NAVSEA

REPAIR OF SHIPBOARD MACHINERY AND EQUIPMENT REQUIRES INFORMATION AND EXPERTISE NOT EASILY AVAILABLE TO SHIPBOARD MAINTENANCE PERSONNEL. WHAT INFORMATION THAT IS AVAILABLE IS GENERALLY EMBEDDED IN TECHNICAL MANUALS OR MAINTENANCE/REPAIR CARDS THAT ARE DIFFICULT TO DECIPHER, BULKY, AND SOMETIMES HARD TO MAINTAIN. A SYSTEM THAT ALLOWED FOR IMPROVED MAINTENANCE AIDING AND GUIDANCE TO NON-EXPERTS WOULD PROVIDE

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A MORE RELIABLE AND BROADLY AVAILABLE CAPABILITY, WHICH WOULD ENHANCE SAFETY, REDUCE COSTS, AND IMPROVE OPERATIONAL READINESS. UNDER TWO PHASE I SBIR CONTRACTS FOR THE USAF (F33615-86-C-5169 AND -5170), THE FEASIBILITY FOR A PORTABLE EXPERT SYSTEM AS A MAINTENANCE AID FOR THE FIELD REPAIR TECHNICIAN IN THE INSPECTION AND REPAIR OF COMPOSITES, WAS DEMONSTRATED USING AN OFF-THE-SHELF EXPERT SYSTEM SHELL AND A PC CLASS LAPTOP PORTABLE COMPUTER. IT IS PROPOSED TO BUILD ON THE WORK AND DEMONSTRATE A MAINTENANCE ADVISOR/TRAINER FOR ONBAORD SHIP USE. IT WILL BE PORTABLE, HAVE VOICE OPERATION, INCORPORATE THE LATEST TECHNOLOGY IN DATA STORAGE, GRAPHICS, AND INTERACTIVE DISPLAYS. IT WILL DEMONSTRATE A SMALL SELECTED SET OF CURRENT MAINTENANCE AIDS.

ACOUSTICAL RESEARCH & APPLICATION
304 MASHIE DR SE
VIENNA, VA 22180
CONTRACT NUMBER:
ALAN O SYKES
TITLE:
HYDROPHONE MODELLING AND DESIGN FOR LOW COST ACOUSTIC
TOPIC# 55 OFFICE: NAVSEA

THIS PROJECT, IF SUCCESSFUL, SHOULD PROVIDE: A GENERAL MODEL AND PROCEDURE FOR USE IN DESIGNING PIEZOELECTRIC SENSORS -- HYDROPHONES, ACCELEROMETERS, ETC.--WHICH WOULD ENABLE THE DESIGNER OF A SENSOR TO PREDICT ITS SENSITIVITIES TO THE STIMULUS FOR WHICH IT WAS DESIGNED, AND TO EXTRANEOUS STIMULI WHICH GENERATE INTERFERING SIGNALS; INFORMATION ON HOW THE CHOICE OF PIEZOELECTRIC MATERIAL AND MODE OF OPERATION, E.G. COMPRESSION OR SHEAR, AFFECT THE PERFORMANCE OF THE DEVICE, AND HOW THE DEVICE SHOULD BE MODIFIED SHOULD IT SENSITIVITY TO EXTRANEOUS SIGNALS BE TOO HIGH; DATA ON HOW SPATIAL VARIABILITY IN POLARIZATION IN MAN-MADE MATERIALS AFFECTS SENSOR PERFORMANCE; AN UNDERSTANDING OF THE ACOUSTIC PERFORMANCE OF PVDF WIRE HYDROPHONES AND THEIR RESPONSE TO ACCELERATION AND FLEXING; ONE OR MORE DESIGNS FOR HYDROPHONES THAT APPEAR SUITABLE FOR LOW COST ACOUSTIC ARRAYS.

ADVANCED COMPOSITE PRODUCTS INC
21 COMMERCE DR
NORTH BRANFORD, CT 06471
CONTRACT NUMBER:
DAVID MAASS
TITLE:
FLAMMABILITY SMOKE TOXICITY AND MECHANICAL PROPERTY
CHARACTERIZATION OF NOVEL THERMOPLASTIC COMPOSITE MATE
TOPIC# 77 OFFICE: NAVSEA

SUBMITTED BY

THE OBJECTIVE OF THIS EFFORT IS TO DEVELOP LIGHTWEIGHT STRUCTURAL COMPOSITE MATERIALS WITH GREATLY IMPROVED FLAMMABILITY, SMOKE GENERATION, AND TOXIC FUME GENERATION (FST) PROPERTIES FOR USE IN NAVY SHIPBOARD APPLICATIONS. THE MATERIALS TO BE EVALUATED CONSIST OF GLASS AND CERAMIC REINFORCING FIBERS BLENDED WITH THERMOPLASTIC FIBERS TO FORM A HIGHLY CONFORMABLE MATERIAL WITH PRECISE FIBER/RESIN VOLUME FRACTION CONTROL. THE THERMOPLASTIC (TP) RESINS TO BE EVALUATED OFFER SIGNIFICANTLY IMPROVED FST PERFORMANCE WHEN COMPARED TO EPOXY AND POLYESTER THERMOSET RESINS. THE CERAMIC FIBERS OFFER EXCELLENT FIRE BARRIER PERFORMANCE AND ARE TO BE EVALUATED AS A PROTECTIVE SURFACE LAYER FOR GLASS FIBER COMPOSITES. PROCESS TRAILS WILL BE PERFORMED TO DEVELOP PARAMETERS FOR THE CONSOLIDATION OF HIGH QUALITY LAMINATES FROM THESE HYBRID MATERIALS. PRELIMINARY MECHANICAL PROPERTY DATA IS GENERATED FOR THE CANDIDATE MATERIALS AND COMPARED TO THE GLASS/PHENOLIC BASELINE. IT IS ANTICIPATED THAT AT THE CONCLUSION OF PHASE I THE DESIREABLE FST AND MECHANICAL PROPERTIES OF THE THERMOPLASTIC MATRIX CERAMIC AND GLASS FIBER COMPOSITE MATERIALS WILL HAVE BEEN DEMONSTRATED.

ADVANCED MICROSPHERE PRODUCTS CO
2038 E FOOTHILL BLVD
PASADENA, CA 91107
CONTRACT NUMBER:
MANCHIUM CHANG
TITLE:
FABRICATION OF NON-SPHERICAL PARTICULATES
TOPIC# 202 OFFICE: NUSC

PARTICULATES OF VARIOUS SHAPES ARE USEFUL IN MANY AREAS OF INDUSTRY. SPECIFICALLY, SUCH PARTICULATES ARE NEEDED TO SIMULATE PLANKTONS IN OCEAN FOR USE IN WATER TUNNEL TESTS. WE PROPOSED TO FABRICATE THE NON-SPHERICAL PARTICULATES BY TWO METHODS: PHOTOLITHOGRAPHIC TECHNIQUES WILL BE USED TO PRODUCE PARTICULATES OF ROD, DISK, STAR, HEXAGONAL OR OTHER DISTINCT GEOMETRICAL SHAPES, AND CHEMICAL TECHNIQUES WILL BE USED TO PREPARE "BRISTLE BRUSH" SHAPED PARTICULATES. IN THE PHOTOLITHOGRAPHIC METHOD, A PHOTOMASK WITH PARTICULATE PATTERNS OF PROPER DIMENSION AND CONFIGURATION WILL BE FABRICATED AND BY USING PHOTORESIST AND PHOTOPROCESSES, AN ARRAY OF PARTICULATES WILL BE REPRODUCED ON AN APPROPRIATE SUBSTRATE. THESE PARTICLES CAN BE COL-

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LECTED FROM THE SUBSTRATE BY ETCHING OR BY ULTRASONICATION. TO PRODUCE BRISTLE BRUSH PARTICULATES, THE IONIC INTERATION FORCES WILL BE USED. IF THE CENTER BODY OF THE BRISTLE BRUSH IS CHEMICALLY TREATED TO BE CATIONIC IN NATURE AND FIBER IS ANIONICALLY CHARGED, SIMPLE MIXING OF THESE TWO IONIC SPECIES WILL RESULT IN HAIRY PARTICULATES.

ADVANCED REFRACTORY TECHNOLOGIES INC
699 HERTEL AVE
BUFFALO, NY 14207
CONTRACT NUMBER:
DR PETER T B SHAFFER
TITLE:
SYNTHESIS OF ULTRAFINE METAL AND ALLOY POWDERS
TOPIC# 52 OFFICE: NAVSEA

THE TREND IN ALL MATERIALS IS TOWARD THE CONTROL OF MICROSTRUCTURE. IN CERAMICS AND CERMETS THE EMPHASIS IS ON THE REDUCTION OF CRYSTALLITE SIZE AND THEREBY ON IMPROVING PHYSICAL PROPERTIES. POWDERS SHOULD BE EQUIZAXED AND LIMITED TO SUBMICRON RANGE, WITHIN A NARROW AND SPECIFIC SIZE DISTRIBUTION. EVEN MORE IMPORTANTLY LARGE QUANTITIES OF POWDERS MUST BE AVAILABLE AT REASONABLE COST. AS PRESENTLY PRODUCED, ULTRAFINE POWDER OF METALS ARE EITHER UNAVAILABLE OR PROHIBITIVELY EXPENSIVE. ART PROPOSES TO INVESTIGATE NEW PROCESS CONCEPTS THAT ARE EXPECTED TO YIELD ULTRAFINE POWDERS OF A VARIETY OF COMPOSITIONS. FURTHERMORE THE CONCEPTS ARE SUCH THAT THEY SHOULD BE SCALED TO PRODUCTION RATES, AND SHOULD BE ECONOMICAL. LASTLY, THEY OFFER THE POSSIBILITY OF PRODUCING ULTRAFINE POWDERS UNDER HIGHLY CONTROLLABLE CONDITIONS, AND THUS YIELD POWDERS WHOSE PROPERTIES ARE NOT ONLY CONTROLLABLE BUT ALSO REPRODUCIBLE.

ADVANCED SYSTEM TECHNOLOGIES INC
12200 E BRIARWOOD AVE - STE 260
ENGLEWOOD, CO 80112
CONTRACT NUMBER:
DR ROBERT T GOETTGE
TITLE:
INTEGRATED RELIABILITY AND TIMING DESIGN ANALYSIS TOOL
TOPIC# 142 OFFICE: NSWC

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DURING DEVELOPMENT OF COMPLEX, EMBEDDED SYSTEMS QUANTITATIVE TRADE-OFFS OF RELIABILITY AND TIMING PERFORMANCE ARE OFTEN NOT CONSIDERED. DEGRADED PERFORMANCE IN ONE OR BOTH OF THESE AREAS CAN RESULT. AN INTEGRATED RELIABILITY AND TIMING ANALYSIS TOOL WILL PROVIDE THE CAPABILITY FOR SIMULTANEOUSLY ASSESSING SYSTEM DESIGNS FOR BOTH CHARACTERISTICS. BY BASING THE TOOL ON AN ICONIC DESIGN REPRESENTATION LANGUAGE IT WILL BE IMMEDIATELY ACCESSIBLE TO SYSTEM DESIGNERS. PREVIOUS RESEARCH WHICH RESULTED IN AN ICONIC LANGUAGE TO SUPPORT ONLY TIMING PERFORMANCE CAN SERVE AS A BASIS FOR THE CURRENT RESEARCH. BEFORE THE INTEGRATED ANALYSIS TOOL CAN BE DEVELOPED, TWO TECHNICAL OBJECTIVES MUST BE RESEARCHED: (1) DEFINE THE SYSTEM DESIGN LANGUAGE CONSTRUCTS TO SUPPORT RELIABILITY ANALYSES; AND (2) SHOW THAT THE RELIABILITY RELATED LANGUAGE CONSTRUCTS ARE AMENABLE TO ICONIC REPRESENTATION. THE PROPOSED RESEARCH WILL ADDRESS THESE TECHNICAL OBJECTIVES BY DEVELOPING THE ICONIC LANGUAGE TO SUPPORT REPRESENTATION AND ANALYSIS OF SYSTEM RELIABILITY.

ADVANCED SYSTEM TECHNOLOGIES INC
12200 E BRIARWOOD AVE - STE 260
ENGLEWOOD, CO 80112
CONTRACT NUMBER:
MOHSEN PAZIRANDEH
TITLE:
ARCHITECTURE EVALUATION TEST BED
TOPIC# 205 OFFICE: NUSC/NAVSEA

THE ESTIMATION OF THE COMPUTER CAPACITIES REQUIRED TO SUPPORT A MISSION ARE USUALLY THE SUBJECT OF MUCH DISCUSSION. ESTIMATES OF THE WORKLOAD AND OTHER PARAMETERS VARY GREATLY. THE REASON FOR THIS IS THAT MOST APPLICATIONS DO NOT FIT THE TRADITIONAL TIMING AND SIZING EFFORT. NONE OF THE THREE COMPONENTS (WORKLOAD, PERFORMANCE REQUIREMENTS AND ARCHITECTURE) IS USUALLY PRESENT. WE CONTEND THAT THE MISSION'S CONCEPTS OF OPERATION AND THE PERCEIVED SCENARIOS HAVE SUFFICIENT INFORMATION TO DERIVE THE WORKLOAD AND THE PERFORMANCE SPECIFICATIONS. THEN USING THESE TWO COMPONENTS WE CAN DERIVE THE SPECIFICATIONS FOR A BASELINE ARCHITECTURE. WE PROPOSE TO RESEARCH THE FEASIBILITY OF THIS IDEA AS A PHASE I PROJECT AND IF OUR OBJECTIVES ARE SATISIFIED TO BUILD A PC-BSED TOOL AND A TESTBED AS A PHASE II PROJECT. THE TOOL WILL PERFORM TWO IMPORTANT TASKS: IT

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WILL (1) USE THE NAVY UNDERWATER SYSTEM CENTER'S MISSION SCENAIRO TO DERIVE THE WORKLOAD MODEL AND PERFORMANCE REQUIREMENTS, (2) USE THE RESULTS OF THE FIRST TASK, AND AN ARCHITECTURE DESIGNED BY THE USER ON THE SCREEN TO ASSESS THE SUFFICIENCY OF THE ARCHITECTURE TO PROCESS THE DERIVED WORKLOAD SUBJECT TO DERIVED PERFORMANCE REQUIREMENTS.

AERO-PLASMA TECHNOLOGIES
2421 GLYNDON AVE
VENICE, CA 90291
CONTRACT NUMBER:
WILLIAM P PESCHEL
TITLE:
IGNITION AND FLAME FRONT SUSTENANCE OF NAVY AIRCRAFT J SYSTEMS BY USE OF MICROWAVE IRRADIATION
TOPIC# 230 OFFICE: NAPC/NAVAIR

AN INNOVATIVE METHOD FOR IGNITION AND FLAME FRONT SUSTENANCE OF JET ENGINE AIRCRAFT PROPULSION SYSTEMS IS PROPOSED. THIS METHOD UTILIZES THE INTERACTION OF CONTROLLED AND CONCENTRATED MICROWAVE ENERGY WITH THE FUEL-AIR MIXTURE IN THE COMBUSTION CHAMBER OR AFTERBURNER. THE HIGHLY EFFICIENT MICROWAVE SOURCES ARE LOCATED EXTERNAL TO THE COMBUSTION CHAMBER AND COUPLED THROUGH CERAMIC WINDOWS. IGNITER COMPONENTS ARE NOT REQUIRED WITHIN THE COMBUSTION CHAMBER, AND FLAME HOLDERS MAY BE MINIMIZED OR ELIMINATED BY DEVELOPING DISTRIBUTED MICROWAVE CENTERS OF ENERGY CONCENTRATION USING STANDING WAVE AND FOCUSING TECHNIQUES COUPLED WITH MULTIPLE RADIATING SOURCES. THE MICROWAVE INTERACTIONS CAN RAPIDLY AND REPEATEDLY DEVELOP ELECTRON POPULATIONS IN PRESELECTED ZONES OF INTEREST IN THE FUEL-AIR MIXTURE WITH THE DEPOSITED ENERGY DENSITY LIMITED ONLY BY THE MICROWAVE SOURCE ENERGY OVER THE ALTITUDE RANGE FOR WHICH FREE START COMBUSTIBLE MIXTURES ARE OBTAINABLE. THUS, IMPROVED START CAPABILITY AND MINIMIZATION OF FLAMEOUT PROBABILITIES SHOULD BE ACHIEVABLE AT ALL THESE ALTITUDES. MICROWAVE IGNITER CONCEPTS AND OPERATING PARAMETERS WILL BE DEFINED, AND IGNITION AND ICNITION SUSTENANCE SCENERIOS WILL BE DEVISED. A DEMONSTRATION TEST WILL BE DEVISED AND PROPOSED FOR PHASE II PERFORMANCE.

AERO-VIRONMENT INC
825 MYRTLE AVE
MONROVIA, CA 91016
CONTRACT NUMBER:
GEORGE P ETTENHEIM JR
TITLE:
A HIGH RESOLUTION: LOW ALTITUDE FLIGHT TEST MINI-SODAR GROUND STATION FOR HELICOPTER AND VERTICAL TAKEOFF LAN
TOPIC# 257 OFFICE: NAVAIR/NATC

SUBMITTED BY

MEASUREMENT OF WIND AND TURBULENCE BY REMOTE SENSING TO A HEIGHT OF AT LEAST ONE KILOMETER ABOVE GROUND LEVEL HAS BECOME WELL ESTABLISHED. SUCH SYSTEMS ARE KNOWN AS DOPPLER ACOUSTIC SOUNDING SYSTEMS (DASS) OR SOUND DETECTION AND RANGING (SODAR). THESE SYSTEMS UTILIZE SOUND AT RELATIVELY LOW FREQUENCIES - 1200 TO 2000 Hz. RECENT EXPERIMENTAL WORK HAS SHOWN THAT THE "MINI-SODAR" HAS GREAT POTENTIAL FOR WIND AND TURBULENCE MEASUREMENTS CLOSE TO THE SURFACE (20 - 300 FEET) WITH IMPROVED ACCURACY AND SPACIAL RESOLUTION. USE OF HIGH FREQUENCIES (4000 - 6000 Hz) PERMITS CONSIDERABLY SMALL SIZE, MORE PORTABILITY AND OPERATION IN NOISY SURROUNDINGS. IT IS STRONGLY BELIEVED THAT "A HIGH RESOLUTION, LOW ALTITUDE FLIGHT TEST MINI-SODAR ANEMOMETER GROUND STATION" CAN BE DEVELOPED FOR HELICOPTER AND VTOL AIRCRAFT BY UTILIZING EXISTING KNOWLEDGE OF SODARS AND ADVANCING THE MINI-SODAR FROM THE EXPERIMENTAL STAGE INTO A COMMERCIAL PRODUCT.

AERO-VIRONMENT INC
825 MYRTLE AVE
MONROVIA, CA 91016
CONTRACT NUMBER:
GRAHAM GYATT
TITLE:
DESIGN AND DEVELOPMENT OF AN R.P.V. TRAINING SYSTEM
TOPIC# 219 OFFICE: NTSC/NAVAIR

THE HIGH COST AND VULNERABILITY OF MANNED AIRCRAFT IS GENERATED RENEWED INTEREST IN THE EMPLOYMENT OF REMOTELY PILOTED VEHICLES (RPVs) FOR A WIDE RANGE OF MISSIONS. AERO-VIRONMENT INC. PROPOSES THE DEVELOPMENT OF A BASIC DESIGN FOR STATE-OF-THE-ART RPV TRAINING SYSTEMS APPLICABLE TO A WIDE RANGE OF VEHICLES AND MISSIONS. THE LOW-COST SYSTEM CONCEIVED WOULD BE USED TO TRAIN NEW RPV OPERATORS AND PROVIDE A MEANS OF MAINTAINING OPERATIONAL READINESS AMONG EXISTING PILOTS WITHOUT RISK OF LOSS TO ACTUAL HARDWARE. THE TRAINER WILL FACILITATE PRACTICE OF PREVIOUS PROHIBITIVE MANEUVERS, THEREBY EXTENDING THE CAPABILITIES OF AN RPV. A MODULAR DESIGN IS PROPOSED WHOSE ELEMENTS MAY BE USED AS BUILDING BLOCKS FOR THE CONSTRUCTION OF A VARIETY OF RPV TRAINING SYSTEMS. THE TRAINER WILL PROVIDE A REALISTIC SIMULATION OF THE VEHICLE DYNAMICS, INCLUDING AUTOPILOT, AND AN ADEQUATE SIMULATED TERRAIN IMAGE FOR VEHICLES WITH ON-BOARD

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CAMERAS. ADDITIONAL FEATURES SUCH AS FREEZE/PLAYBACK CAPABILITY, INSTRUCTOR COMMANDED SYSTEM FAILURES OR WEATHER MODIFICATIONS, AUTOMATIC DIAGNOSTIC FEEDBACK TO THE STUDENT AND DEPLOYABILITY WILL BE INCLUDED. THE STUDY COVERS IDENTIFICATION OF SYSTEM REQUIREMENTS, HARDWARE SELECTION, SOLUTION METHODS, SOFTWARE ORGANIZATION, AND THE DEVELOPMENT OF A SHELL PROGRAM TO DEMONSTRATE AN EXAMPLE TRAINING SYSTEM.

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825 MYRTLE AVE
MONROVIA, CA 91016
CONTRACT NUMBER:
DR P B S LISSAMAN
TITLE:
DESIGN AND DEVELOPMENT OF AN EXPENDABLE GLIDER SYSTEM
TOPIC# 190 OFFICE: NADC/NAVAIR

DISPERSING SONAR BUOYS OVER A TWO-DIMENSIONAL OCEAN AREA WOULD BE FACILITATED IF SOME OF THE BUOYS WOULD GLIDE PERPENDICULAR TO THE FLIGHT PATH OF THE DISPENSING AIRPLANE. TO DEVELOP THE TECHNOLOGY FOR THIS LATERAL FLIGHT, A PROGRAM IS PROPOSED WHICH, AFTER OUR INTERACTIONS WITH THE SPONSOR ON PATTERN SHAPE AND ACCURACY REQUIREMENTS, 1) EXPLORES VARIOUS CONFIGURATION CHANGES WHICH WOULD PROVIDE A GLIDE RATIO EXCEEDING 1:1 FOR A VEHICLE HAVING SPIRAL STABILITY; 2) INVESTIGATES METHODS FOR GUIDING THE VEHICLE APPROXIMATELY ALONG THE PERPENDICULAR; 3) TESTS SOME CANDIDATE VEHICLES TO ESTABLISH HOW WELL THEY ACHIEVE (1) AND ESTABLISH IF THEY CAN FLY STRAIGHT ENOUGH TO SIMPLIFY (2) WITHOUT RESOURCE TO ACTIVE CONTROL; AND THEN 4) PRESENTS RECOMMENDATIONS ABOUT THE BEST WAY TO MOVE TOWARD THE GOAL OF A VERY INEXPENSIVE DEVICE. THERE ARE MANY TRADEOFFS BETWEEN THE REQUIRED PATTERN, THE MODIFIED BUOY CONFIGURATION, AND THE TECHNIQUES FOR ACHIEVING STABILITY AND CONTROL, ALL CONSIDERED WITHIN A FRAMEWORK OF RELIABILITY AND LOW COSTS IN MASS PRODUCTION. THUS THIS IS TO BE AN INTERACTIVE SYSTEMS ENGINEERING PROGRAM, WITH A STRONG EMPHASIS ON INNOVATIVE SOLUTIONS.

AERODYNE PRODUCTS CORP
76 TREBLE COVE RD
NORTH BILLERICA, MA 01862
CONTRACT NUMBER:
KURT D ANNEN
TITLE:
A NON-INTRUSIVE TURBINE TEMPERATURE FOR DIAGNOSTIC AND APPLICATIONS
TOPIC# 229 OFFICE: NAPC/NAVAIR

SUBMITTED BY

ACCURATE MEASUREMENTS OF TURBINE BLADE TEMPERATURES ARE IMPORTANT IN MONITORING TURBINE HEALTH AND PERFORMANCE AND IN DIAGNOSING PROBLEMS. CURRENT INTRUSIVE AND OPTICAL TECHNIQUES HAVE SHORTCOMINGS. THERMOCOUPLES HAVE PROBLEMS WITH DURABILITY AND ACCURACY. TWO COLOR PYROMETRY LSO ENCOUNTERS PROBLEMS WITH ACCURACY DUE TO INTERFERENCE BY REFLECTED RADIATION AND PARTICULARLY REFLECTED EMISSION FROM THE COMBUSTOR. A MEASUREMENT TECHNIQUE IS PROPOSED WHICH IS INSENSITIVE TO REFLECTED EMISSION, AND, THEREFORE, CAPABLE OF MUCH HIGHER ACCURACIES. THE TECHNIQUE DETERMINES THE COMPONENT TEMPERATURES BY MEASURING THE CHANGE IN INFRARED EMISSION PRODUCED BY IRRADIATION FROM A 1 US LASER PULSE. THE SURFACE TEMPERATURE DETERMINATION IS NOT SENSITIVE TO EITHER THE INTENSITY OR THE DURATION OF THE LASER PULSE. THE MEASUREMENT SYSTEM CAN BE RUGGEDIZED FOR USE ON AN ENGINE BY COUPLING THE LASER AND DETECTORS WITH THE ENGINE OPTICS BY OPTICAL FIBERS. THE SYSTEM IS CAPABLE OF AN ACCURACY OF 10 DEG F IN THE MEASUREMENT OF BLADE TEMPERATURES IN THE RANGE OF 1000 DEG F TO 2500 DEG F.

AERODYNE RESEARCH IN
45 MANNING RD
BILLERICA, MA 01821
CONTRACT NUMBER:
DR ROBERT GUGUENIN
TITLE:
SYNTHETIC MODELING OF SHIPBORNE IRST CLOUD/SEA INFRARE SCENES
TOPIC# 141 OFFICE: NSWC

THIS PROJECT WILL DEFINE A COMPUTER SIMULATION CAPABILITY THAT CAN SYNTHESIZE CLOUD CLUTTER AND SEA RADIANCE SCENES MEASURED BY SHIPBORNE IRST SENSORS. THE CAPABILITY WILL BE AN EXPANSION OF ARI'S EXISTING AERIE (AERODYNE INFRARED EARTH) IR BACKGROUND RADIANCE SIMULATION CODE, DEVELOPED TO SYNTHESIZE INFRARED SCENE RADIANCES MEASURED BY IMAGING SENSORS. DETAILS OF THE PHYSICAL PROPERTIES OF THE CLOUDS, SEA STATE, AND ATMOSPHERE THAT WILL INCLUDE IN THE MODELING CAPABILITY WILL BE DETERMINED. NECESSARY ADDITIONS TO THE EXISTING AERIE IR PHENOMENOLOGY AND RADIATIVE TRANSFER CALCULATION CAPABILITY TO HANDLE THE PHYSICAL MODELS OF CLOUDS, SEA, AND ATMOSPHERE WILL ALSO BE DETERMINED. AN INNOVATIVE SCENE PARAMETER SPECIFICATION SYSTEM FOR AERIE THAT WILL ALLOW THE CUSTOMER TO CREATE SCENE

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SIMULATIONS USING SETS OF SIMPLE METEOROLOGICAL AND SENSOR INPUT PARAMETERS WILL BE DETERMINED AS ONE OF THE MAJOR GOALS OF THE EFFORT.

AIR TURBINE TECHNOLOGY INC
6001 PARK OF COMMERCE BLVD
BOCA RATON, FL 33431
CONTRACT NUMBER: N60530-88-C-0127
JAMES V THEIS
TITLE:
HIGH-TEMPERATURE TURBINE--ADVANCED DEVELOPMENT
TOPIC# 173 OFFICE: NWC/NAVAIR

THE PHASE I PROGRAM WILL BE DIRECTED TOWARD THE DEVELOPMENT OF A HIGH-TEMPERATURE, HIGH-SPEED TURBINE WHEEL DRIVEN BY HIGH-TEMPERATURE COMPRESSED AIR. CONCEPTS AND DETAILS WILL BE FORMULATED AND DESIGNED WITH REGARD TO EFFICIENCY, WEIGHT, COST, OPERATING PARAMETERS, AND RELIABILITY. OVERALL SIZE OF THE TURBINE WHEEL WILL BE LESS THAN 8 INCHES IN DIAMETER. TURBINE WHEEL/NOZZLE CONFIGURATIONS WILL BE ANALYZED AND EVALUATED INCONJUNCTION WITH OPERATING PARAMETERS (12KW NOMINAL, 100 KRPM, EFFICIENCY GREATER THAN 50%, AND INLET AIR TEMPERATURE FROM 2,500-3,500 DEGREES F, AND AN OPERATIONAL LIFE OF MORE THAN 100 HOURS AT DESIGN SPEED. VARIOUS CERAMIC AND COMPOSITE MATERIALS WILL BE REVIEWED AND SELECTED BASED UPON OPERATING STRESSES AND THERMAL/FLUID COMPATIBILITY COMMENSURATE WITH PHYSICAL PROPERTIES, AVAILABILITY, COST AND MANUFACTURING EASE. COMPUTER ANALYSES WILL BE UTILIZED IN MODELING STEADY STATE TURBINE PERFORMANCE CHARACTERISTICS, DYNAMIC BALANCE/STABILITY, DAMPING, BEARING PRELOAD, AND STRESS SURVEYS, TO ESTABLISH COMPLETE DESIGN CRITERIA. IN ADDITION, AIR TURBINE TECHNOLOGY EXPERIENCE WITH HIGH-SPEED SPINDLES AND HIGH HORSEPOWER TURBINES WILL BE USED TO ADVANCE THE ABILITY TO MACHINE HIGH ABRASIVE OR SUPER HARD MATERIALS USING HIGH SURFACE SPEED DIAMOND CUTTERS.

AMERASIA TECHNOLOGY INC
620-1 HAMPSHIRE RD
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER:
DR EDWARD J STAPLES
TITLE:
MAGNETO-STATIC SURFACE WAVE SENSOR
TOPIC# 80 OFFICE: NAVSEA

SUBMITTED BY

THERE IS A NEED FOR MINIATURE SINGLE AXIS MAGNETIC SENSOR CAPABLE OF DETECTING SMALL MAGNETIC FIELD PERTURBATIONS (NANOTESLAS). HOWEVER, UTILIZING RECENTLY DEVELOPED MAGNETO-STATIC SURFACE WAVE (MSWW) RESONATORS TOGETHER WITH SMALL RARE-EARTH MAGNETS, A SMALL (<10 cm[3]) AND SENSITIVE MAGNETIC FIELD DETECTOR CAN BE REALIZED. A PAIR OF MSSW RESONATOR CONTROLLED OSCILLATORS WHOSE DIFFERENTIAL OUTPUT FREQUENCY IS PROPORTIONAL TO MAGNETIC FIELD IS PROPOSED. A RARE-EARTH MAGNET PROVIDES THE NECESSARY BIAS WHILE REMAINING TRANSPARENT TO EXTERNAL MAGNET FIELDS. PRELIMINARY CALCULATIONS INDICATE A RESOLUTION OF <0.20 NANOTESLA AND A DYNAMIC RANGE OF 10 TO THE 9TH POWER (2000 Oe) CAN BE ACHIEVED. EXTERNAL BIAS FIELDS OF OVER 100 Oe CAN BE ACCOMMODATED AND FREQUENCIES FROM DC TO 1000 Hz COVERED. THE PROPOSED SENSOR REQUIRES MINIMAL CIRCUITRY AND UTILIZES LOW-POWER CMOS COUNTERS WHICH INTERFACE DIRECTLY TO DIGITAL EQUIPMENTS WITHOUT A/D CONVERTERS. APPLICATIONS ARE A MINIATURE SOLID-STATE COMPASS AND AS A LOW-FIELD MAGNETOMETER FOR MAPPING THE EARTH'S MAGNETIC FIELD OR SEARCHING FOR SUBMERGED UNDERWATER MINES AND SUBMARINES.

AMERICAN BIOTECHNOLOGY CO
7658 STANDISH PL - STE 107
ROCKVILLE, MD 20855
CONTRACT NUMBER:
DR PETER E MAXIM
TITLE:
EVALUATION OF THE IMMUNE MODULATOR MFBL FOR ANTIVIRAL
TOPIC# 4 OFFICE: ONR

THE METHYLFURYLBUTYROLACTONES (MFBL'S) ARE A UNIQUE GROUP OF CHEMICAL COMPOUNDS THAT COMPRISE A NEW GROUP OF SYNTHETIC IMMUNOMODULATORS. THE COMPOUNDS ARE WATER SOLUBLE, RELATIVELY NON-TOXIC, ECONOMICAL TO PRODUCE IN QUANTITY, AND EFFECTIVE WHEN ADMINISTERED VIA THE INTRAVENOUS, INTRAPERITONEAL OR ORAL ROUTES. THE DRUGS HAVE BEEN SHOWN TO POSSESS A WIDE RANGE OF IMMUNOMODIFYING PROPERTIES. MURINE SPLENOCYTES FROM DRUG TREATED ANIMALS ARE: MORE RESPONSIVE TO MITOGENS AND ANTIGENS IN LYMPHOCYTE PROLIFERATION ASSAY, RESPOND TO IN VITRO STIMULATION BY PRODUCING LARGE QUANTITIES OF INTERLEUKIN-2 AND GAMMA INTERFERON AND RESPOND TO T-DEPENDENT ANTIGEN CHALLENGE BY PRODUCING LARGER QUANTITIES OF ANTIBODY FORMING CELLS. THE DRUGS ALSO HAVE BEEN SHOWN TO FUNCTION TO STIMULATE HOST FIRST LINE DEFENSE

SUBMITTED BY

AGAINST BACTERIA BY ACTIVATING POLYMORPHONUCLEAR ANTIBACTERIAL ACTIVITY. A STUDY TO EVALUATE THE FEASIBILITY OF USING MFBL'S AS THERAPEUTIC AND PROPHYLACTIC ANTIVIRAL AGENTS IS DESCRIBED IN THIS PROPOSAL. USING A WELL-DEFINED MODEL SYSTEM, ACUTE AND CHRONIC INFECTION OF MICE WITH LYMPHOCYTIC CHORIOMENINGITIS VIRUS, THE ABILITY OF MFBL TO MODIFY CRITICAL HOST ANTIVIRAL EFFECTOR MECHANISMS WILL BE EVALUATED.

AMERICAN ELECTRONICS INC
9332 ANNOPLIS RD
LANHAM, MD 20706
CONTRACT NUMBER:
DR PATRICK W JOHNSON
TITLE:
AN ARTIFICIAL INTELLIGENCE NEURAL NET COMPUTER WHICH I
DATA FROM ARTIS OPUS AND MK XV TO IDENTIFY AIR TARGETS
TOPIC# 105 OFFICE: NAVAIR

PRESENT AND PLANNED AIR-TO-AIR MISSILES HAVE EFFECTIVE RANGES THAT GREATLY EXCEED A PILOT'S ABILITY TO IDENTIFY AN AIRCRAFT. AS A RESULT, THE EFFECTIVENESS OF THESE WEAPONS IS GREATLY REDUCED. SYSTEMS SUCH AS ARTIS, OPUS AND MK XV IFF INCREASE THE RANGE AT WHICH AIRCRAFT CAN BE IDENTIFIED, BUT EACH HAS A CHARACTERISTIC PERFORMANCE ENVELOPED IN WHICH IT FUNCTIONS OPTIMALLY. WHAT IS NEEDED IS AN ARTIFICIAL INTELLIGENT SYSTEM INTEGRATION DEVICE WHICH CAN FUSE THE DATA FROM EACH OF THESE SYSTEMS TO PRODUCE A SINGLE RELIABLE AND UNAMBIGUOUS IDENTIFICATION OF AIR TARGETS. BY COMBINING DATA, IDs AT GREATER RANGE AND IN LESS OPTIMAL CONDITIONS SHOULD BE POSSIBLE. THIS PHASE I PROPOSAL IS FOR AN ARTIFICAL INTELLIGENCE PARALLELED PROCESSING COMPUTER BASED UPON NEURAL NETWORK ARCHITECTURES WHICH CAN PERFORM THIS SENSOR INTEGRATION WITH EXTREME SPEED AND ACCURACY. IN ADDITION, THIS RESEARCH WILL TEST THE FEASIBILITY OF USING THE SAME NEURAL NET DESIGN AS A PATTERN RECOGNIZER TO ENHANCE THE SPEED AND ACCURACY OF THE CURRENT ARTIS AND OPUS SIGNAL PROCESSING ALGORITHMS TO PRODUCE FASTER, MORE ACCURATE IDENTIFICATIONS AT THE INDIVIDUAL SYSTEM LEVEL THAN IS NOW POSSIBLE.

AMERICAN ENERGY VALVE CO
6311 ANTOINE
HOUSTON, TX 77091
CONTRACT NUMBER:
ROBERT G DAVENPORT
TITLE:
NOISE SUPPRESSOR DEVELOPMENT - QUITE VALVES FOR AIR PR
REDUCTION MANIFOLDS
TOPIC# 233 OFFICE: NOSC/NAVSEA

SUBMITTED BY

THIS PROPOSAL WILL DEMONSTRATE (IN 2" TO 4" SIZE), A NOISE REUCING TRIM THAT CAN BE UTILIZED IN ROTARY CONTROL/ON-OFF BALL VALVES. THIS VALVE TRIM ADDRESSES NOISE AT THE SOURCE. THE BASIC DESIGN HAS A VARIABLE IMPEDENCE TRIM TO CAUSE A HIGH IMPEDENCE AT LOW ANGLES OF OPENING AND LOW IMPEDENCE (VERY LITTLE FLOW RESTRICTION) AT LARGE OPENING ANGLES. IT IS AN IDEAL VALVE FOR PRESSURIZATION/DE-PRESSURIZATION, BLOW-DOWN AND VARIABLE DELTA P-VARIABLE FLOW CONTROL APPLICATIONS. TYPICAL NOISE ATTENUATION RANGES FROM-15-30dBA DEPENDING UPON TRIM ARRANGEMENT AND SELECTION.

ANALYTICS INC
2500 MARYLAND RD
WILLOW GROVE, PA 19090
CONTRACT NUMBER:
STEPHEN W LEIBHOLZ
TITLE:
DATA COMPRESSION FOR NAVAL MESSAGES (ADM/EDM)
TOPIC# 35 OFFICE: SPAWAR

ANALYTICS HAS DEVELOPED A TECHNIQUE WHICH WE CALL MHC, OR MODIFIED HUFFMAN CODING. OUR PROPOSED UTILIZATION AND IMPLEMENTATION OF THIS INNOVATIVE TOOL WOULD REQUIRE NO MODIFICATIONS TO EXISTING NAVAL C3 SYSTEMS. THIS PHASE I SBIR WILL INVESTIGATE THE FEASIBILITY AND USABILITY OF A UNIQUE FORM OF ENCODING THAT WE HAVE DEVELOPED. OUR CONCEPTUAL DESIGN FOR THIS SYSTEM, WE BELIEVE, CAN COMPRESS TYPICAL NAVAL MESSAGE CONTENT FIELDS BY A FACTOR OR 70-80 PERCENT -- THAT IS, AN APPROXIMATE 4:1 TO 5:1 REDUCTION ON COMMUNICATIONS BANDWIDTH, WITHOUT SACRIFICING INTEROPERABILITY OR COMPATIBILITY WITH EXISTING NAVAL AND DOD SYSTEMS, WITH JINTACCS, AND POSSIBLY ENHANCING CRYPTOGRAPHIC STRENGTH IN THE PROCESS. ANALYTICS ENVISIONS THE PROPOSED MHC CONVERTER TO BE IN THE FORM OF A PREPROCESSOR THAT CAN BE EMBEDDED IN A STANDARD NAVY COMMUNICATIONS TERMINAL, OR PLACED ON A LINE BETWEEN A TERMINAL AND THE C-3 PROCESSING SYSTEM. IN THIS EMBODIMENT, THE MHC CONVERTER WOULD BE TRANSPARENT TO THE USER AND TO MILITARY COMMUNICATIONS SYSTEMS INCLUDING AUTODIN, DDN, JANAPS AND RELATED SYSTEMS. THE TECHNICAL OBJECTIVE OF THIS PHASE I SBIR IS TO ANALYZE, TEST, AND SIMULATE OUR UNIQUE CONCEPT FOR DATA COMPRESSION. THE PROPOSED RESEARCH EFFORT WILL CULMINATE IN A DEVICE THAT WILL MINIMIZE THE NEGENTROPHY OF THE TOTAL NAVAL COMMUNICATION SYSTEM.

SUBMITTED BY

ANAMET LABS INC
3400 INVESTMENT BLVD
HAYWARD, CA 94545
CONTRACT NUMBER:
ROCKY RICHARD ARNOLD
TITLE:
METHODOLOGY FOR PREDICTING CANOPY FRACTURING PATTERNS
EJECTION
TOPIC# 193 OFFICE: NADC/NAVAIR

THE PHASE I RESEARCH PROPOSED HEREIN ADDRESSES THE NEED TO DETERMINE THE OPTIMUM PLACEMENT OF MILD DETONATION CORD ON AIRCRAFT CANOPIES TO ENSURE THAT DURING EJECTION THE CANOPIES WILL DISINTEGRATE INTO PIECES THAT DO NOT INFLICT INJURY ON THE ESCAPING PILOT. THE PROPOSED APPROACH UTILIZES FINITE ELEMENT METHODOLOGY IN COMBINATION WITH RECENTLY DEVELOPED TWO-DIMENSIONAL CRACK-TIP ELEMENTS OF SUPERIOR UTILITY AND ACCURACY. THE RESULTING PROCEDURE, WHICH WILL BE REFINED AND DEVELOPED DURING THIS RESEARCH, PROVIDES ASSURANCE THAT THE ANALYTICAL PREDICTIONS WILL BE ACCURATE. WHEN COMBINED WITH A TECHNIQUE FOR LOCATING AREAS OF VULNERABILITY TO CRACKING FROM THE IMPULSIVE FORCES OF THE MILD DETONATING CORD, THE FINALLY DEVELOPED PROCEDURE WILL BE BOTH ACCURATE AND COST-EFFECTIVE.

ANCO ENGINEERS INC
9937 JEFFERSON BLVD
CULVER CITY, CA 90232
CONTRACT NUMBER:
JOHN C STOESSEL
TITLE:
GEARTOOTH PRESSURE SENSOR
TOPIC# 62 OFFICE: NAVSEA

HYDRODYNAMIC PRESSURE GENERATED BY MESHING GEARS IN AN OIL BATH CONTRIBUTE TO THE SELF NOISE OF TORPEDOES. AS TARGETS BECOME "QUITER," TORPEDO GUIDANCE SYSTEMS MUST INCREASE THEIR SENSITIVITY TO THE ATTENUATED SOUND WAVES REFLECTED BY THE TARGET. IN BEING MORE SENSITIVE, THEY CAN BE DISTURBED BY THEIR OWN NOISE. AS A RESULT,

SUBMITTED BY

IT IS VERY IMPORTANT TO UNDERSTAND SELF NOISE SOURCES AND MITIGATE THE EFFECTS. THE PROPOSED TRANSDUCER SYSTEM, BASED ON PIEZOELECTRIC PLASTIC FILM AND DATA TELEMETRY, IS SMALL AND THIN ENOUGH TO MEASURE THE HYDRODYNAMIC PRESSURE AT THE GEAR ROOT. THE TRANSDUCER WILL HAVE A LARGE FREQUENCY AND DYNAMIC RANGE. IT WILL ALLOW MEASUREMENTS IN SITU THAT WILL PROVIDE THE DATA NEEDED TO UNDERSTAND AND REDUCE HYDRODYNAMIC PUMPING ACTION NOISE.

APPLIED MATHEMATICS INC
PO BOX 637 - 1663 RTE 12
GALES FERRY, CT 06335
CONTRACT NUMBER:
DR WILLIM J BROWNING
TITLE:
ASW SEARCH PLANNING
TOPIC# 47 OFFICE: NAVSEA

ASW PASSIVE SONAR SEARCH PLANNING CONSISTS OF TWO MAJOR AREAS: EMPLOYMENT OF THE SEARCHING PLATFORM (COURSE, SPEED, DEPTH, AND TRACK PLAN) AND SONAR SYSTEM LINEUP SELECTIONS. THESE TWO AREAS ARE INTER-DEPENDENT, BUT THE DEGREE AND NATURE OF THE INTERACTION IS NOT WELL UNDERSTOOD. CURRENT SONAR LINEUP MODELS ARE STATIC IN NATURE AND DO NOT ADEQUATELY MODEL THE DYNAMIC ASPECTS OF THE SEARCH PROBLEM. IN ADDITION, DETECTION PERFORMANCE IS ASSUMED TO BE SYMMETRICAL. WE PROPOSE TO DEVELOP SEARCH PLANNING METHODS FOR OPTIMIZING ASYMMETRICAL DETECTION PERFORMANCE BY COMPLETING THE FOLLOWING TASKS: TASK 1. DEVELOP A MATHEMATICAL MODEL OF THE SUBMARINE PASSIVE SONAR SEARCH OPTIMIZATION PROBLEM. TASK 2. DERIVE A MATHEMATICAL PROGRAMMING ALGORITHM FOR A SPECIFIC CASE OF THE SONAR LINEUP PROBLEM, AND TASK 3. COMPARE THE RESULTS FROM TASK 2 WITH A SEARCH SIMULATION MODEL CURRENTLY IN USE BY THE SUBMARINE FORCE.

APPLIED TECHNOLOGY ASSOCS INC
1900 RANDOLPH RD SE
ALBUQUERQUE, NM 87106
CONTRACT NUMBER:
HENRY R SEBESTA
TITLE:
LOW COST POINTING AND TRACKING SYSTEM FOR OPTICAL COMM
TOPIC# 36 OFFICE: SPAWAR

SUBMITTED BY

OPTICAL COMMUNICATION LINKS HAVE SEVERAL ADVANTAGES FOR SHIP-TO-SHIP APPLICATIONS. KEY FEATURES WHICH MAKE OPTICAL COMMUNICATION ATTRACTIVE INCLUDE HIGH DATA BANDWIDTH AND EASE OF PROTECTION FROM INTERCEPTION. THE PERFORMANCE REQUIREMENTS FOR POINTING AND TRACKING SYSTEMS FOR OPTICAL COMMUNICATION LINKS ARE DEMANDING WHEN EITHER TRANSMITTER OR RECEIVER IS ON A MOVING VEHICLE. CONSEQUENTLY, SUCH SYSTEMS ARE COSTLY TO DESIGN AND MANUFACTURE. THIS RESEARCH PROGRAM SEEKS COST-EFFECTIVE TECHNOLOGY AND CONCEPTUAL DESIGNS FOR THE POINTING AND TRACKING SYSTEM. PHASE I PROCEEDS WITH A FOUR-STEP PLAN IN A TOP-DOWN FASHION TO A LOW COST POINTING AND TRACKING SYSTEM WHICH DOES NOT HAVE UNDESIRED COMPLICATIONS AND COSTS ON THE OVERALL COMMUNICATION SYSTEM. INNOVATIVE TECHNOLOGIES IN THE AREAS OF MECHANICAL DESIGN AND FABRICATION, OPTICAL AND CONTROL CONFIGURATIONS, MICROPROCESSOR BASED CONTROL ELECTRONICS, SENSORS, MATERIALS AND MANUFACTURING PROCESSES WILL BE EVALUATED.

APPLIED TECHNOLOGY ASSOCS INC
1900 RANDOLPH RD SE
ALBUQUERQUE, NM 87106
CONTRACT NUMBER:
TIMOTHY J SCHNEEBERGER
TITLE:
PRECISION OPTICAL TRACKING FOR SHORT RANGE ENGAGEMENT
TOPIC# 132 OFFICE: NSWC

THE INTENT OF THIS WORK IS TO DEVELOP AN ADVANCED ESTIMATION ALGORITHM FOR MANEUVERING TARGET STATE ESTIMATION AND PREDICTION. THE ALGORITHM WILL BE USED FOR FIRE CONTROL IN THE LOCAL AREA DEFENSE ROLE. THE TARGET STATE ESTIMATOR USES TWO DIMENSIONAL INFRA-RED ELECTRO-OPTICAL IMAGERY AND RADAR DATA TO COMPUTE CURRENT AND PREDICT FUTURE TARGET STATES. INCLUDED IN THIS ANALYSIS WILL BE ALGORITHMS FOR PATTERN RECOGNITION, GEOMETRIC CONVERSION, KINEMATIC-TO-ASPECT CONVERSION, AND ASPECT ANGLE ESTIMATION. THIS WORK WILL THEN BE COUPLED WITH AN EXISTING KINEMATIC STATE ESTIMATOR. THE RESULT WILL BE A REALISTIC PREDICTOR OF THE IMPROVED PERFORMANCE REALIZABLE WHEN RADAR MEASUREMENTS ARE AUGMENTED WITH OPTICAL SENSOR MEASUREMENTS IN PREDICTING TARGET STATES.

APTEK INC
2862 S CIRCLE DR - STE 346
COLORADO SPRINGS, CO 80906
CONTRACT NUMBER:
ANTHONY W RASKOB JR
TITLE:
LAMINAR/TURBULENT FLOW DETECTOR
TOPIC# 204 OFFICE: NUSC

SUBMITTED BY

THE HIGHLY SUCCESSFUL BOUNDARY LAYER ACOUSTIC MONITOR (BLAM) PROGRAM PRODUCED BLAM GAUGES WHICH WERE USED ON MINUTEMAN FLIGHTS TO TEST FLOW AROUND RE-ENTRY VEHICLES (RV), AND DETECT THE LOCATION OF THE TRANSITION TO TURBULENT FLOW. IT IS POSTULATED THAT THESE BLAM GAUGES CAN BE RECONFIGURED TO OPERATE TO DETECT TURBULENT FLOW IN WATER TUNNELS. IN ORDER TO EFFECT THIS REDESIGN, THE WATER TUNNEL ENVIRONMENT, AS IT COMPARES TO THE RV ENVIRONMENT AND THE IMPACT THIS DIFFERENCE MAKES, MUST BE EVALUATED. STARTING WITH EXISTING HAND-BOOKS, A TYPICAL WATER TUNNEL ENVIRONMENT WILL BE MODELED. THE BLAM GAUGE WILL BE REDESIGNED SO AS TO OPTOMIZE IT'S FUNCTION IN THE WATER ENVIRONMENT.

AQUANAUTICS CORP
4560 HORTON ST - BLDG Q/STE #111
EMERYVILLE, CA 94608
CONTRACT NUMBER:
BRUCE ZENNER
TITLE:
OXYGEN GENERATION UTILIZING NON-CRYOGENIC PROCESSES
TOPIC# 241 OFFICE: DTNSRDC

AQUANAUTICS CORPORATION IS CURRENTLY DEVELOPING FOR THE DEFENSE ADVANCED RESEARCH PROJECTS AGENCY (DARPA) A PROCESS FOR EXTRACTING PURE OXYGEN FROM SEAWATER. THIS TECHNOLOGY COULD BE ADAPTED FOR NAVAL SURFACE VESSEL OXYGEN-FROM-AIR EXTRACTION. THIS TECHNOLOGY USES SPECIALLY DESIGNED WATER-SOLUBLE OXYGEN-BINDING MOLECULES AND A MEMBRANE SYSTEM TO EXTRACT FREE MOLECULAR OXYGEN SELECTIVELY FROM THE EXTERNAL ENVIRONMENT, EITHER A GAS OR LIQUID. THE OXYGENATED CARRIER FLUID THEN FLOWS TO AN ELECTROCHEMICAL CELL WHERE ITS OXIDATION STATE IS ALTERED, CAUSING THE OXYGEN TO BE RELEASED AS A GAS. THE CARRIER FLUID'S OXYGEN AFFINITY IS THEN RECIRCULATED TO REPEAT THE CYCLE. AQUANAUTICS' RESEARCH TEAM OF FIVE PH.D. SCIENTISTS IS COMPRISED OF ELECTROCHEMISTS, PHYSICAL AND ORGANIC CHEMISTS AND BIOCHEMISTS. IT IS SUPPLEMENTED VIA RESEARCH RELATIONSHIPS WITH DUKE UNIVERSITY AND THE UNIVERSITY OF CALIFORNIA AT DAVIS, WHOSE CHEMISTRY DEPARTMENT PROVIDES DESIGN AND SYNTHESIZING CAPABILITY FOR NEW OXYGEN-BINDING COMPOUNDS. THE AQUANAUTICS' PROCESS POTENTIALLY HAS MANY ADVANTAGES OVER CRYOGENIC AND MOLECULAR SIEVE TECHNOLOGY, INCLUDING HIGH PURITY (99.5%), LOWER MANUFACTURING AND MAINTENANCE COST, LOWER ENERGY

SUBMITTED BY

CONSUMPTION, RESISTANCE TO CHEMICAL CONTAMINATION AND THE CAPABILITY TO PRODUCE A PURE NITROGEN BY-PRODUCT. AQUANAUTICS IS A WELL-FUNDED, PUBLICLY-HELD CORPORATION WHICH HAS PRIOR SBIR EXPERIENCE.

ARGOTEC INC
3650 C HACIENDA BLVD
FT LAUDERDALE, FL 33314
CONTRACT NUMBER:
BERNARD S WILLARD
TITLE:
VERY LOW FREQUENCY HIGH POWER SONAR PROJECTOR
TOPIC# 61 OFFICE: NAVSEA

THE SEEMINGLY IMPOSSIBLE TASK OF PRODUCING ONE-HALF OF A MEGAWATT OF ACOUSTIC POWER UNDERWATER AT A FREQUENCY OF 5 Hz IS ADDRESSED. THE EXPLOITATION OF THE RECENT INTRODUCTION OF NEW RARE EARTH PERMANENT MAGNET MATERIALS, THE CONCEPT OF USING A FLEXURAL DISC RADIATOR, AND THE RECENT CULMINATION OF TWO YEARS OF ELECTRODYNAMIC TRANSDUCER DEVELOPMENT IS PROPOSED. THE USE OF MATHEMATICAL MODELING, EXPLORATORY DEVELOPMENT MODEL FABRICATION, AND EXPERIMENTAL MEASUREMENTS TO ASSIST AND VERIFY PERFORMANCE PREDICTIONS IS ALSO PROPOSED. THE OFFERER CITES SEVERAL RECENTLY DESIGNED, CONSTRUCTED AND TESTED UNITS OF HIS ORIGIN AND PROPOSES THE DEVELOPMENT OF AN ARRAY ELEMENT WHICH BENEFITS FROM EXTENSIVE DEVELOPMENT ALREADY ACCOMPLISHED. THE CONSIDERATION OF A PISTON-TYPE RADIATOR AS WELL AS FLEXURAL TYPES IS RECOMMENDED. THE POSSIBILITY OF CONSTRUCTING A FULL-SCALE ARRAY ELEMENT USING A COMPANY-OWNED MAGNET ASSEMBLY IS DISCUSSED.

ARGOTEC INC
3650 C HACIENDA BLVD
FT LAUDERDALE, FL 33314
CONTRACT NUMBER:
BERNARD S WILLARD
TITLE:
LOW FREQUENCY UNDERWATER SOUND CALIBRATION SOURCE
TOPIC# 60 OFFICE: NAVSEA

MOVING-COIL TRANSDUCERS ARE USUALLY ASSOCIATED WITH LOW POWER, LOW

SUBMITTED BY

EFFICIENCY, BROADBAND AND VERY LOW FREQUENCY APPLICATIONS. THE RECENT INTRODUCTION OF RARE EARTH PERMANENT MAGNETIC MATERIALS HAVING HIGH ENERGY DENSITIES AND THE RECENT DEVELOPMENT OF BETTER DESIGN TECHNIQUES SIGNIFICANTLY IMPROVE EFFICIENCY, POWER HANDLING ABILITY, AND HIGH FREQUENCY OPERATION. THE APPLICATION OF THESE IMPROVEMENTS AND A NEW TECHNIQUE FOR REDUCING DAMPING, THEREBY RAISING Q, ARE PROPOSED TO SATISFY THE HIGH EFFICIENCY, LOW FREQUENCY REQUIREMENT OF THE SOLICITED TASK.

ASSESSMENT SYSTEMS CORP
2233 UNIVERSITY AVE - STE 310
ST PAUL, MN 55114
CONTRACT NUMBER:
C DAVID VALE
TITLE:
COMPUTER-BASED ITEM POOL EVALUATION SOFTWARE
TOPIC# 220 OFFICE: NPRDC/ONT

SUBSTANTIAL IMPROVEMENTS IN TEST EFFICIENCY RESULTING FROM THE USE OF ITEM RESPONSE THEORY AND COMPUTERIZED TESTING MAY BE COMPROMISED IF DUPLICATE OR SUBSTANTIALLY SIMILAR TEST ITEMS APPEAR IN ITEM POOLS. THE PROPOSED PROJECT WILL DESIGN, IMPLEMENT, AND EVALUATE SEVERAL PROCEDURES FOR DETECTING SUBSTANTIALLY SIMILAR ITEMS IN AN ITEM POOL. THESE PROCEDURES WILL RANGE FROM SIMPLE ELEMENT AND TOKEN MATCHING PROCEDURES TO PROCEDURES MATCHING ELEMENTS OF SYNTACTIC AND SEMANTIC PARSES OF THE ITEMS. THE EVALUATION WILL COMPARE THE EFFECTIVENESS OF THE PROCEDURES WHEN APPLIED TO REPRESENTATIVE CAT-ASVAB ITEM BANKS. ADDITIONALLY, THE UTILITY OF THE INTERMEDIATE STRUCTURES AND STRUCTURAL PARAMETERS IN GENERATING NEW ITEMS AND PREDICTING RESPONSE-MODEL ITEM PARAMETERS WILL BE INVESTIGATED. PHASE I WILL RESULT IN PROGRAMS TO DETECT DUPLICATE ITEMS. PHASE II WILL REFINE THE PROGRAMS FOR LARGE-SCALE PRODUCTION USE AND DEVELOP THE TECHNIQUES OF ITEM GENERATION AND PARAMETER PREDICTION, SHOULD PHASE I SHOW THE LATTER TO BE FEASIBLE.

ASSOCIATED CORP
19 SPRING ST
NEWPORT, RI 02840
CONTRACT NUMBER:
DAVID T BARRY
TITLE:
SEQUENTIAL DESIGNS FOR MINE WARFARE PLANNING
TOPIC# 88 OFFICE: NAVSEA

SUBMITTED BY

THE OBJECTIVE OF THIS PROPOSED RESEARCH IS TO DEVELOP NEW ANALYTIC METHODS FOR CHARACTERIZING MINE WARFARE EFFECTIVENESS. IT WILL USE A COMBINATION OF A PRIOR KNOWLEDGE OF SEQUENTIAL CHOICE OUTCOMES AND UNCERTAINTY IN SEQUENTIAL OUTCOMES. THE APPROACH WILL BE TO DEVELOP A SEQUENTIAL DESIGN ANALYSIS OF PERFORMANCE FOR INDIVIDUAL MINE FIELDS WHICH FULLY CHARACTERIZES SYSTEM PERFORMANCE LINKED TO OBJECTIVES MEASURABLE MINE AND MINE FIELD PLACEMENT ATTRIBUTES. PHASE I WILL INVOLVE 4 TASKS. IN TASK 1 WE WILL REVIEW CURRENT AND LIKELY FUTURE MINE PLANNING AIDS AND RELATE THEM TO SEQUENTIAL DESIGNS MODELLING. IN TASK 2 WE WILL DEVELOP AN OVERALL EQUENTIAL DESIGN ANALYTIC DESCRIPTION OF MINE FIELDS. IN TASK 3 WE WILL EVALUATE QUANTITATIVELY THE MOST PROMISING SEQUENTIAL DESIGN MODEL AGAINST CURRENT PLANNING MODELS. IN TASK 4 WE WILL INVESTIGATE THE FEASIBILITY OF GENERALIZING THE APPROACH. IN PHASE II, WE WILL DEVELOP A MANUAL OR COMPUTERIZED AID TO CONDUCT TESTS.

ASTER ASSOCS
99 WEST ST
MEDFIELD, MA 02052
CONTRACT NUMBER:
DR DAVID W STOWE
TITLE:
LOW COST MASS PRODUCED ENVIRONMENTALLY STABLE SINGLE M
TOPIC# 49 OFFICE: NAVSEA

FIBER OPTIC COUPLERS ARE FOUND IN MOST CURRENT APPLICATIONS OF FIBER OPTICS, FROM INSTRUMENTATION THROUGH TELECOMMUNICAIONS SYSTEMS AND FIBER OPTIC SENSORS. IN SPITE OF THEIR IMPORTANCE, FIBER OPTIC COUPLERS ARE STILL MADE BY HIGHLY LABOR INTENSIVE PROCESSES THAT ARE NOT PARTICULARLY AMENABLE TO AUTOMATION. COUPLING BETWEEN FIBERS IS A CONSEQUENCE OF THE OVERLAP OF THE EVANESCENT ELECTRIC FIELDS OF TWO (OR MORE) WAVEGUIDES. TYPICALLY FIBERS ARE EITHER POLISHED OR ETCHED, FUSED AND DRAWN TO ALLOW EVANESCENT COUPLING TO OCCUR. ASTER PROPOSES TO DEVELOP A MANUFACTURING PROCESS IN WHICH EACH KEY TASK IS EITHER AUTOMATED OR SEMIAUTOMATED AND ENABLES BATCH PROCESSING WHEREVER APPROPRIATE. THE PROCESS WILL PROVIDE CONSISTENTLY HIGH-PERFORMANCE RELIABLE ENVIRONMENTATLLY STABLE COUPLERS WITH A SUBSTANTIAL COST REDUCTION.

ATLANTIC APPLIED RESEARCH CORP
129 MIDDLESEX TURNPIKE
BURLINGTON, MA 01803
CONTRACT NUMBER:
FRED R KERN JR
TITLE:
PROPULSION MACHINERY SYSTEM NOISE PREDICTION MODEL
TOPIC# 16 OFFICE: ONT/DTRC

SUBMITTED BY

OVER THE LAST 15 YEARS DETAILED METHODS HAVE BEEN DEVELOPED TO PREDICT THE TORSIONAL AND LATERAL VIBRATION OF PROPULSION GEAR TRAINS USING LUMPED PARAMETER, DISTRIBUTED MASS-ELASTIC PARAMETER AND STATISTICAL ENERGY ANALYSIS TECHNIQUES. BY IMPROVING THE DETAIL USED FOR THE PROPELLER, SHAFTING AND SOUND ISOLATION COUPLINGS ON THE OUTPUT AND TURBINE ROTOR, SHAFTING AND COUPLING MODELLING, ON THE INPUT OF THE CURRENT MODELS, THEY CAN READILY BE EXPANDED TO PROVIDE BOTH THE SOLICITED TORIONAL MODEL AND ALSO A CASING VIBRATION PREDICTION MODEL, VALID OVER A WIDE FREQUENCY RANGE. THIS MODEL WILL BE DOCUMENTED AND EXPLAIN THE ANALYTICAL MODELS USED TO REPRESENT THE PHYSICAL COMPONENTS OF THE SYSTEM IN TERMS FAMILIAR TO NAVAL ENGINEERS.

ATLANTIC APPLIED RESEARCH CORP
129 MIDDLESEX TURNPIKE
BURLINGTON, MA 01803
CONTRACT NUMBER:
NEAL A BROWN
TITLE:
INNOVATIVE METHODS FOR SUBMARINE DETECTION
TOPIC# 22 OFFICE: ONT

A NOVEL ACTIVE SONAR IS SUGGESTED WHEREIN THE CAVITATION NOISE OF A SHIP'S SCREWS PROVIDES INSONIFICATION OF DISTANT TARGETS AND A TOWED LINE ARRAY PASSIVE SONAR PROVIDES THE RECEIVER OF REFLECTED SIGNALS. THE UNDERWATER RADIATED NOISE SOURCE IS CONTINUOUS IN FREQUENCY AND TIME, AND IS OF MODEST POWER. AN OWNER-SHIP OR COOPERATING SHIP OR SUBMARINE TOWED LINE ARRAY WILL CONTINUOUSLY MONITOR THE SOURCE SHIP RADIATION IN A USEFUL LOW-TO-MID FREQUENCY INTERVAL. DETECTION WILL BE EFFECTED BY CROSS-CORRELATING MONITORED SOURCE SIGNALS WITH RECEIVER BEAM OUTPUT SIGNALS. THE POTENTIAL PROCESSING GAIN IS PROPORTIONAL TO TIME-BANDWIDTH PRODUCT. NUMERICAL ESTIMATES INDICATE THAT IF THE POTENTIAL PROCESSING GAIN IS REALIZED, RELIABLE DETECTION OF SUBMARINES IS POSSIBLE IN THE FIRST CONVERGENCY ZONE. THIS BY ANY TLA SHIP WITH THE NECESSARY COMPUTING POWER. IT IS PROPOSED TO INVESTIGATE FEASIBILITY BY SIZING THAT COMPUTING POWER AND BY EXAMINING SEVERAL FACTORS WHICH CAN COMPROMISE THE PROCESSING GAIN. IT IS FURTHER PROPOSED TO PLAN ANY NECESSARY MEASUREMENTS AND A DEMONSTRATION OF FEASIBILITY, IF INDICATED.

SUBMITTED BY

ATLANTIC APPLIED RESEARCH CORP
129 MIDDLESEX TURNPIKE
BURLINGTON, MA 01803
CONTRACT NUMBER:
MICHAEL J RUDD
TITLE:
LOW COST ACOUSTIC SENSOR TECHNOLOGY
TOPIC# 55 OFFICE: NAVSEA

AN ANALYTICAL MODEL OF THE RESPONSE OF FIBER OPTIC AND PIEZO-ELECTRIC POLYMER HYDROPHONES TO MECHANICAL VIBRATION, WILL BE DERIVED AND COMPARED WITH AT-SEA TRIAL DATA. ADDITIONAL NOISE MECHANISMS SUCH AS THERMAL FLUCTUATIONS OR PYRO-ELECTRICITY WILL BE EXAMINED. A DESIGN FOR LOW NOISE HYDROPHONES WILL BE PRODUCED.

ATLANTIC APPLIED RESEARCH CORP
129 MIDDLESEX TURNPIKE
BURLINGTON, MA 01803
CONTRACT NUMBER:
MICHAEL J RUDD
TITLE:
LOW COST TELEMETRY SYSTEM
TOPIC# 56 OFFICE: NAVSEA

A LOW COST FIBER OPTIC TELEMETRY SYSTEM IS PROPOSED FOR TOWED ARRAYS. A CONVENTIONAL PIEZO-ELECTRIC HYDROPHONE MODULATES AN FET WHICH IN TURN MODULATES AN LED. THE LIGHT FROM THE LED PROPAGATES UP A FIBER TO A PHOTO-DETECTOR ON THE MOTHER SHIP. A SEPARATE FIBER IS REQUIRED FOR EVERY CHANNEL. HOWEVER, THE TECHNOLOGY IS SIMPLE AND LOW RISK.

ATLANTIC APPLIED RESEARCH CORP
129 MIDDLESEX TURNPIKE
BURLINGTON, MA 01803
CONTRACT NUMBER:
STEVEN A AFRICK
TITLE:
REAL TIME DYNAMIC ANALYZER FOR QUALITY CONTROL OF RUBB
TOPIC# 154 OFFICE: NSWC

SUBMITTED BY

A SYSTEM FOR RAPID MEASUREMENT OF EFFECTIVE DYNAMIC PROPERTIES OF ELASTOMERIC PARTS (INCLUDING FINISHED PARTS FOR QUALITY CONTROL) WILL BE DEVELOPED. THIS SYSTEM WILL BE MICROCOMPUTER BASED AND "USER FRIENDLY" FOR USE BY NONSPECIALISTS IN A MANUFACTURING SETTING. IT WILL ALSO BE A USEFUL LABORATORY TOOL WHICH CAN BE EMPLOYEL TO RELATE EFFECTIVE PROPERTIES OF PARTS TO INTRINSIC DYNAMIC PROPERTIES AND GEOMETRIES. THE MAJOR OBJECTIVES OF THE PHASE I EFFORT ARE TO DEVELOP HARDWARE AND SOFTWARE TECHNIQUES FOR SAMPLE PREPARATION, MEASUREMENT PARAMETER SELECTION, AND DATA MANAGEMENT--INCLUDING REAL TIME QUALITY ASSURANCE. THESE FUNCTIONS WILL NOT REQUIRE DETAILED KNOWLEDGE OF THE MEASUREMENT PROCESS TO IMPLEMENT MAKING THE SYSTEM AVAILABLE TO MINIMALLY TRAINED PERSONNEL. ALSO, THE SYSTEM ACCURACY WILL BE QUANTIFIED. ACHIEVEMENT OF THESE GOALS WILL BE DEMONSTRATED BY THE ASSEMBLY AND TESTING OF A DEMONSTRATION SYSTEM. IN ADDITION, THE DESIGN WILL ALLOW FOR MODIFICATIONS MAKING POSSIBLE MEASUREMENTS OF DYNAMIC PROPERTIES UNDER STATIC STRAIN. INCORPORATION OF THIS UNIQUE FEATURE WILL BE A PRIMARY GOAL IN PHASE II, IN WHICH A PROTOTYPE SYSTEM WILL BE DELIVERED.

ATLANTIC APPLIED RESEARCH CORP
129 MIDDLESEX TURNPIKE
BURLINGTON, MA 01803
CONTRACT NUMBER:
DR FRED R KERN JR
TITLE:
DEVELOPMENT OF SUBMARINE STRUCTURAL VIBRATION TRANSMIS
TOPIC# 234 OFFICE: NOSC/NAVSEA

THE ACTIVE SONARS TYPICALLY USED ON SUBMARINES OPERATE AT FREQUENCIES HIGH ENOUGH TO BE DIFFICULT IF NOT PRESENTLY IMPOSSIBLE TO MODEL ACCURATELY WITH FINITE ELEMENT ANALYSIS. LIKEWISE BEAM AND CYLINDER MODELS PROVIDE INADEQUATE REPRESENTATIONS OF THE HIGH FREQUENCY BEHAVIOR OF PLATE AND FRAME VIBRATIONS. THE APPLICATION OF THE AARC STATISTICAL ENERGY ANALYSIS PROGRAM WHICH INCLUDES BENDING, LONGITUDINAL AND TRANSVERSE SHEAR IN-PLANE MODES IS PROPOSED AS THE MAJOR MODELLING TOOL, WITH ADDITIONAL INPUTS FROM FINITE ELEMENT MODELS AS NEEDED. SINCE SEA MAY BE SOME WHAT UNFAMILIAR TO SOME USERS, A USERS INSTRUCTION MANUAL IS ALSO PROPOSED TO BOTH PROVIDE A REVIEW OF SEA PRINCIPLES AND PROVIDE APPLICATION GUIDANCE THROUGH MODELLING

SUBMITTED BY

EXAMPLES.

AUTOMATED ANALYSIS CORP
2001 COMMONWEALTH - STE 204
ANN ARBOR, MI 48105
CONTRACT NUMBER:
JOE JUAN
TITLE:
EXPLORATORY DEVELOPMENT OF SHIP MOTIONS EFFECTS ON ROB AND EQUIPMENT LIFE
TOPIC# 85 OFFICE: NAVSEA

THE INTENTION IS TO INVESTIGATE THE SHIP MOTION EFFECTS ON ROBOT DYNAMICS AND EQUIPMENT LIFE. THE ON-BOARD ROBOT IS EQUIVALENT TO A STATIONARY ROBOT WITH BASE EXCITATION DUE TO SHIP MOTION. THE EXCITATION AT THE ROBOT BASE WILL BE MONITORED EITHER BY PLACING GYROSCOPES AND ACCELEROMETERS AT THAT POSITION, OR BY ASSUMING THE SHIP IS A RIGID BODY AND PLACING GYROSCOPES AND ACCELEROMETERS ON THE SHIP ONLY. THE BASE EXCITATION VALUES ARE USED IN DERIVING THE ROBOT DYNAMIC MODEL USING THE LAGRANGE-EULER APPROACH. THE DYNAMIC PROJECTION FUNCTIONS WILL BE FUNCTIONS OF THE PITCH, ROLL AND YAW OF THE VESSEL AT SEA. A MODEL REFERENCE ADAPTIVE CONTROL SYSTEM WILL BE DEVELOPED TO CONTROL THE ROBOT MANIPULTOR UNDER UNCERTAINTIES. A SEAKEEPING PROGRAM WILL BE USED TO DETERMINE THE FREQUENCIES AND IMPOSING FORCES ON THE ROBOT SYSTEM.

AXXON VOICE PRODUCTS
720 S CAMINO GRANDE
ANAHEIM, CA 92807
CONTRACT NUMBER:
BRUCE POETSCH
TITLE:
VOICE AIDED PROGRAMMING WORKSTATION
TOPIC# 165 OFFICE: JCMPO

THE OBJECTIVE OF THIS PHASE I PROPOSAL IS TO PRODUCE A PROTOTYPE VOICE AIDED PROGRAMMING WORKSTATION. VOICE AIDED PROGRAMMING BRINGS TOGETHER SEVERAL NEW TECHNOLOGIES, INCLUDING DIGITIZED RECORDING OF

SUBMITTED BY

VOICE AND VOICE RECOGNITION, FOR THE PURPOSE OF IMPROVING PROGRAMMER PRODUCTIVITY. RECORDING THOUGHTS, RATHER THAN TYPING THEM, CAN MAKE THE DESIGN PROCESS MUCH EASIER AND MORE NATURAL. INTERMIXING TYPED TEXT AND RECORDING VOICE IS SYNERGISTIC, WITH TYPED TEXT GIVING STRUCTURE AND VOICE RECORDING PROVIDING A WAY TO EASILY "PUT DOWN ON PAPER" THOSE FLEETING DESIGN CONCEPTS. STARTING WITH A BASIC OUTLINE, A PROGRAMMER CAN SUCCESSIVELY REFINE IDEAS FROM VAGUE CONCEPTS INTO USABLE SOFTWARE. IN ADDITION TO VOICE RECORDING, PRE-DEFINED VOICE COMMANDS CAN BE GIVEN TO THE COMPUTER DURING THE DESIGN PROCESS, AND ALSO THROUGHOUT THE CODING AND DEBUGGING STAGES OF SOFTWARE DEVELOPMENT. A VOICE AIDED PROGRAMMING WORKSTATION WILL HAVE VOICE RECOGNITION, VOICE RESPONSE AND VOICE RECORDING AS INTEGRATED ELEMENTS OF A SYSTEM DESIGNED TO SPEED-UP AND IMPROVE THE SOFTWARE DEVELOPMENT PROCESS.

AZAK CORP
9738 NEVADA
CHATSWORTH, CA 91311
CONTRACT NUMBER:
DR JUDD Q BARTLING
TITLE:
DESIGN/PERFORMANCE INFORMATION FOR I.R. SIGNAL PROCESS
LIZES RANDOM SIGNAL PROCESSING TECHNIQUES FOR SEPARATE
TOPIC# 113 OFFICE: NAVAIR

THE OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP DESIGN AND PERFORMANCE INFORMATION NEEDED FOR THE CONSTRUCTION OF A "BRASS BOARD" RADOM BOARD AND SIGNAL PROCESSOR OPERATING IN THE I.R. RADIATION REGION (LONG WAVE LENGTH AS WELL AS OF 2 TO 6 MICRONS). RADOM SIGNAL PROCEEDING TECHNIQUES POSSESS THE POTENTIAL FOR CREATING A QUANTUM JUMP IN CAPABILITIES FOR LOCATING AND IDENTIFYING I.R. EMITTING TARGETS OR THREATS HIDDEN IN CLUTTER (BACKGROUND). FOR EXAMPLE, RADOM SIGNAL PROCESSING APPLIED TO THE I.R. REGION PROVIDES THE CAPABILITY TO SEPARATE A WEAK TARGET'S OR A THREAT'S I.R. SIGNAL FROM THE STRONGER I.R. CUTTER (BACKGROUND) EVEN WHEN THE FREQUENCE SPECTRUMS OF THE CLUTTER (BACKGROUND) AND TARGET (THREAT) SIGNALS OVERLAP. RANDOM SIGNAL PROCESSING TECHNIQUES ARE WELL FOUNDED IN THEORY.

BATTERY ENGINEERING INC
1636 HYDE PARK AVE
HYDE PARK, MA 02136
CONTRACT NUMBER:
DR CARL SCHLAIKJER
TITLE:
IMPROVED LITHIUM/THIONYL CHLORIDE CELLS USING NEW ELEC
TOPIC# 87 OFFICE: NAVSEA/NSWC

SUBMITTED BY

THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO LIMIT VOLTAGE DELAY, ANODE CORROSION DURING INTERMITTENT USAGE AND TO INCREASE THE CURRENT CAPABILITY AND CAPACITY OF Li/SOCl(2) CELLS THROUGH THE USE OF NEW ELECTROLYTE SALTS. THE PRINCIPLES USED WILL BE THOSE WHICH HAVE SUCCEEDED IN THE PAST, NAMELY, BY LIMITING THE CONCENTRATION OF THE ELECTROLYTE SALT AND BY USING THE LITHIUM SALTS OF LARGE ANIONS WHICH EITHER CANNOT EXCHANGE WITH THE LITHIUM CHLORIDE SOLID ELECTROLYTE INTERPHASE, OR HAVE REDUCED ABILITY TO EXCHANGE. HOWEVER, THE NEW SALTS WILL NOT BE SUBJECT TO OXIDATION BY THE RELEVENT AND WILL NOT BE EXPENSIVE. THE WORK WILL INCLUDE THE SYNTHESIS AND ANALYSIS OF THE NEW SALTS, MEASUREMENTS OF SOLUBILITIES AND PRELIMINARY EVALUATION OF CAPACITY, RATE CAPABILITY, AND VOLTAGE DELAY, USING AA CELLS, COMPARING THE NEW ELECTROLYTES WITH 1.8M LiAlCl4/SOCl(2) FRESH AND AFTER STORAGE AT 71 DEG C FOR ONE MONTH.

BATTERY ENGINEERING INC
1636 HYDE PARK AVE
HYDE PARK, MA 02136
CONTRACT NUMBER:
DR CARL SCHLAIKJER
TITLE:
CALCIUM PRIMARY CELLS WITH IMPROVED ANODE STABILITY AN
DENSITY
TOPIC# 87 OFFICE: NVSEA/NSWC

THE GOALS OF THE PROGRAM ARE TO DECREASE ANODE CORROSION AND DISCHARGE OVER-POTENTIAL, AND TO INCREASE THE CAPACITY OF CALCIUM SOLUBLE CATHODE PRIMARY CELLS, BY USING A NOVEL SULFUR DIOXIDE BASED ELECTROLYTE. IN THE PRESENCE OF CALCIUM IONS AND THE NEW ELECTROLYTE, SULFUR DIOXIDE WAS REDUCED ON CARBON IN EXPERIMENTAL CELLS TO CALCIUM SULFIDE, NOT CALCIUM DITHIONITE. ONE CERTAIN ADVANTAGE IS THAT TWO EQUIVALENTS ARE OBTAINED PER MOLE OF SULFUR DIOXIDE INSTEAD OF ONE, AS IN THE Li/SO2 PRIMARY CELL. WE PROPOSE TO DETERMINE WHETHER D SIZE PROTOTYPE CALCIUM CELLS WITH SUPERIOR CAPACITY CAN BE CONSTRUCTED. THE CaCl2 FILM HAS BEEN BLAMED FOR THE CORROSION AND POLARIZATION OF THE ANODES IN CALCIUM/OXYHALIDE CELLS, SINCE CaCl2 IS AN ANION CONDUCTOR, NOT A CATION CONDUCTOR AS IS THE SALT FILM ON LITHIUM ANODES IN LITHIUM CELLS. IF THE SALT FILM ON CALCIUM IN THE NEW ELECTROLYTE IS ALSO CaS, WHICH IS A CATION CONDUCTOR, THEN CAL-

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CIUM ANODES MAY DISCHARGE BY THE SAME MECHANISM WHICH ALLOWS LITHIUM ANODES TO DISCHARGE EFFICIENTLY. USING PROTOTYPE D CELLS AND THE NEW ELECTROLYTE, WE PROPOSE TO DETERMINE WHETHER CALCIUM CORROSION AND POLARIZATION CAN BE REDUCED.

BEND RESEARCH INC
64550 RESEARCH RD
BEND, OR 97701
CONTRACT NUMBER:
RODERICK J RAY
TITLE:
DEVELOPMENT OF A MEMBRANE-BASED COMPRESSED-AIR DEHYDRA
TOPIC# 240 OFFICE: DTNSRDC

THE NAVY HAS A NEED FOR A RELIABLE, COMPACT, AND ENERGY-EFFICIENT COMPRESSED-AIR DEHYDRATION SYSTEM. WE PROPOSE TO DEVELOP SUCH A SYSTEM BASED ON SYNTHETIC MEMBRANE TECHNOLOGY. PRELIMINARY EXPERIMENTAL AND DESIGN STUDIES AT BEND RESEARCH INDICATE THAT IT IS POSSIBLE TO DEVELOP MEMBRANES AND MEMBRANE MODULES DESIGNED SPECIFICALLY FOR THIS APPLICATION--RESULTING IN A SYSTEM THAT CONTAINS ONLY ABOUT 20 FT2 OF MEMBRANE. AT THE HEART OF THIS SYSTEM IS A NEW TYPE OF MEMBRANE MODULE THAT OVERCOMES THE MAJOR SHORTCOMINGS OF CONVENTIONAL MEMBRANE MODULES WHEN USED FOR AIR DEHUMIDIFICATION. FOR THE PHASE I PROGRAM WE PROPOSE TO INVESTIGATE THE FEASIBILITY OF DEVELOPING THESE OPTIMIZED MEMBRANES AND MEMBRANE MODULES AND TO DELIVER A PREPROTOTYPE MODULE; UNDER PHASE II WE WILL BUILD AND DELIVER A FULL PROTOTYPE THAT WILL BE THE MODEL FOR COMMERCIAL PRODUCTION IN PHASE III.

BEND RESEARCH INC
64550 RESEARCH RD
BEND, OR 97701
CONTRACT NUMBER:
SCOTT B McCRAY
TITLE:
DEVELOPMENT OF FOULING- AND CHLORINE-RESISTANT REVERSE MEMBRANES
TOPIC# 243 OFFICE: DTNSRDC

SUBMITTED BY

REVERSE OSMOSIS (RO) IS A PROMISING NEW PROCESS FOR SHIPBOARD PRODUCTION OF POTABLE WATER FROM SEAWATER. HOWEVER, CURRENT RO SYSTEMS SUFFER FROM TWO PROBLEMS: 1) FOULING CAUSED BY THE FEED STREAMS, AND 2) CHEMICAL DEGRADATION OF THE RO MEMBRANES DUE TO DISINFECTANTS (USUALLY CHLORINE) USED IN THE FEED STREAM. EXTENSIVE PRETREATMENT IS THUS NEEDED WHEN CURRENT RO SYSTEMS ARE USED ON SEAWATER. THUS, THE DEVELOPMENT OF A FOULING- AND CHLORINE-RESISTANT MEMBRANE IS CRITICAL FOR PRACTICAL OPERATION OF SUCH SYSTEMS. BEND RESEARCH (BRI) HAS DEVELOPED A FOULING-RESISTANT MEMBRANE MODULE THAT TREATS FOULING-PRONE FEED SOLUTIONS WITHOUT SUBSTANTIAL LOSS IN PERFORMANCE. NAVY FUNDING IS THUS NOT NEEDED FOR THAT ASPECT OF THE PHASE I PROGRAM. PREVIOUS WORK AT BRI HAS ALSO PRODUCED "FIRST GENERATION" CHLORINE-RESISTANT MEMBRANES CAPABLE OF MAINTAINING HIGH SALT REJECTIONS WHILE OPERATING ONCHLORINATED FEED STREAMS. HOWEVER, THESE MEMBRANES EXHIBIT EXCESSIVE FLUX DECLINES WHEN EXPOSED TO CHLORINE. WE PROPOSE HERE TO DEVELOP "SECOND GENERATION" MEMBRANES--MEMBRANES CAPABLE OF MAINTAINING HIGH SALT REJECTIONS AND HIGH WATER FLUXES WITH CHLORINATED FEED STREAMS. IN A PHASE II PROGRAM, THESE MEMBRANES WOULD BE INCORPORATED INTO OUR FOULING-RESISTANT HOLLOW-FIBER MODULES.

BIOSPHERICAL INSTRUMENTS INC
4901 MORENA BLVD - STE 1003
SAN DIEGO, CA 92117
CONTRACT NUMBER:
CHARLES R BOOTH
TITLE:
MARINE ULTRAVIOLET RADIATION MEASUREMENT INSTRUMENTATI
TOPIC# 2 OFFICE: ONR

THE FIELD OF MARINE PHOTOCHEMISTRY IS A SPECIAL FOCUS AREA FOR ONR, AND THE LEADING RESEARCHERS IN THIS FIELD HAVE VOICED A STRONG NEED FOR INSTRUMENTATION TO MEASURE THE ATTENUATION OF ULTRAVIOLET LIGHT IN THE OCEAN. BIOSPHERICAL INSTRUMENTS IS THE LEADING DEVELOPER OF NEW TYPES OF OPTICAL OCEANOGRAPHIC SENSORS, AND IS UNIQUELY SUITED TO DEVELOP SENSORS AND INSTRUMENTATION IN THIS AREA OF OCEANOGRAPHY. THIS PROPOSAL OUTLINES A PLAN FOR THE DEVELOPMENT AND TESTING OF THIS INSTRUMENTATION. THE DESIGN WILL BE CHARACTERIZED BY COMPUTER MODELING, AND BOTH LABORATORY AND FIELD TESTS. THE ANTICIPATED IN-

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STRUMENTS WILL BE WELL SUITED TO VERTICAL PROFILING, ENCORPORATING A WIDE RANGE DATA ACQUISITION SYSTEM UNDER MICROPROCESSOR CONTROL. THE SYSTEM WILL BE RUGGED, BATTERY POWERED, AND SUITED TO OPERATION FROM OCEANOGRAPHIC SHIPS AND SMALL BOATS. THE SYSTEM WILL BE ABLE TO BE LOWERED THROUGH HOLES IN THE ICE CAP AS WELL.

BIOSPHERICAL INSTRUMENTS INC
4901 MORENA BLVD - STE 1003
SAN DIEGO, CA 92117
CONTRACT NUMBER:
CHARLES R BOOTH
TITLE:
INSTRUMENTATION FOR UNDERSEA VISIBILITY MONITORING
TOPIC# 238 OFFICE: NOSC/NAVSEA

THE PROPOSAL PRESENTS A DESIGN FOR A VISIBILITY MONITORING INSTRUMENT FOR USE UNDERWATER AT LOW LIGHT LEVELS. THE INSTRUMENT WILL USE SOLID STATE PHOTODETECTORS, AND WILL PROVIDE A DYNAMIC RANGE OF 10 TO THE 5TH POWER TO 10 TO THE - 6TH POWER FOOT-CANDLES IN CONJUNCTION WITH A 10 cm. PATH TRANSMISSOMETER TO MEASURE TWO IMPORTANT PARAMETERS USED IN ESTIMATING TARGET VISIBILITY IN TURBID MEDIA. THE DESIGN WILL MAKE USE OF MICROPROCESSOR BASED DATA ACQUISITION SYSTEMS, BE FULLY BATTERY POWERED, AND USE A "LAPTOP" PERSONAL COMPUTER AS A DISPLAY AND STORAGE MEANS. THE COMPACT DESIGN WILL BE PORTABLE AND SUITABLE TO OPERATION FROM A BOSTON WHALER SKIFF.

BRUBAKER INC
883 SANTA CRUZ AVE
MENLO PARK, CA 94025
CONTRACT NUMBER:
DAVID I BRUBAKER
TITLE:
MODEL BASED DESIGN PROCEDURE FOR HARD REAL-TIME SOFTWA
TOPIC# 125 OFFICE: NSWC

CURRENT PRACTICE IS DESIGNING HARD REAL-TIME SYSTEMS (SYSTEMS WHICH MUST OPERATE UNDER CRITICAL EXTERNAL TIMING CONSTRAINTS) LEAVE LITTLE PROVISION FOR GUARANTEEING STRINGENT TIMING SPECIFICATIONS WILL BE

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MET. HARD TIMING CONSTRAINTS ARE BASED ON THE NEED OF THE SYSTEM TO INTERACT WITH STIMULI FROM ITS ENVIRONMENT (THE WORLD EXTERNAL TO ITSELF), WHILE EXECUTING INTERNAL PROCESSES IN NON-ZERO TIMES. WHEN TIMING CONSTRAINTS ARE VIOLATED, SOME SORT OF FAILURE WILL OCCUR, EITHER IN THE SYSTEM, OR IN THE SYSTEM'S ABILITY TO PROVIDE SPECIFIED CONTROL TO ITS ENVIRONMENT. THE PROPOSED EFFORT PROVIDES A MECHANISM FOR INCLUDING HARD REAL-TIME CONSTRAINTS IN THE SOFTWARE DESIGN PHASE. THIS IS DONE BY INCORPORATING MODELS OF THE RESPECTIVE CRITICAL MECHANISMS (EXTERNAL TIMING PARAMETERS, INTERNAL EXECUTION DELAYS, ETC.) INTO AN EXISTING DESIGN AND SIMULATION MODEL. DESIGN CONSISTS OF BUILDING A MODEL OF THE PROPOSED SYSTEM, WHILE EXECUTION OF THAT MODEL PROVIDES A SIMULATION OF THE SYSTEM IN ITS SIMULATED ENVIRONMENT. TIMING CONSTRAINTS ARE INCLUDED IN BOTH PHASES, WITH A MEANS OF THE USER MONITORING SYSTEM TIMING DURING SIMULATION. EXTENSIVE CONTROL OVER THE ENVIRONMENT MODEL IS PROVIDED TO TEST TIMING MARGINS AND SYSTEM RESPONSE TO TIMING CONSTRAINT VIOLATION FAILURES.

BRUBAKER INC
883 SANTA CRUZ AVE
MENLO PARK, CA 94025
CONTRACT NUMBER:
DAVID I BRUBAKER
TITLE:
RAPID PROTOTYPING PROCEDURE FOR REAL-TIME EMBEDDED COM
TOPIC# 176 OFFICE: NWC/DNT

MOST EXISTING DEVELOPMENT PROCEDURES PRESUME THE GENERATION OF A DETAILED SPECIFICATION DOCUMENT PRIOR TO INITIALIZATION OF THE DESIGN PROCEDURE. DETAILED REQUIREMENTS FOR THE DEVELOPMENT OF REAL-TIME EMBEDDED COMPUTER SYSTEMS ARE GENERALLY NOT AVAILABLE FOR MUCH OF THE SYSTEM WHEN THE DESIGN PROCESS MUST BE INITIATED. THE NEED EXIST FOR A MECHANISM TO DEVELOP PARTS OF THE SYSTEM THAT ARE HIGH RISK AND LEAST UNDERSTOOD EARLY IN THE DESIGN PHASE SO THAT BOTH USERS AND DEVELOPERS CAN LEARN AND REFINE THE REQUIREMENTS. THE PROPOSED EFFORT WILL DEVELOP SUCH A MECHANISM. BASED ON HIGH LEVEL REQUIREMENTS, THE PROCEDURE WILL ASSIST BOTH THE SYSTEM DESIGNER AND THE END USER IN THE FORMAL DEFINITION OF SYSTEM REQUIREMENTS. IN ADDITION, BY TIGHTLY COUPLING THE OUTPUT OF THE PROTOTYPING PHASE WITH THE IMPLEMENTATION SOFTWARE, THE PROCEDURE BECOMES A STRONG TOOL FOR USE

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DURING DEBUG, VERIFICATION TESTING, AND SUBSEQUENT SYSTEM MODIFICATIONS. THE PROPOSED PROCEDURE IS GRAPHICS BASED, AND IS DESIGNED TO BE EASILY TRANSLATED INTO ADA FOR FINAL SYSTEM DESIGN AND CODING. ALTHOUGH INTERACTIVE WITH THE USER, THE PROCEDURE INSURES ADA-BASED STRUCTURE IS RETAINED THROUGHOUT THE USER OF THE PROCEDURE.

CALIBER INC
9488 VOLLMERHAUSEN DR
COLUMBIA, MD 21046
CONTRACT NUMBER:
DAVID M SCHWABER
TITLE:
ACOUSTIC PROPERTIES OF NEOPRENE TRANSDUCER WINDOWS
TOPIC# 63 OFFICE: NAVSEA

A NEOPRENE HAVING UNDERSTOOD AND CONTROLLED COMPOSITION IS CRITICAL TO THE ACOUSTIC PERFORMANCE OF A TORPEDO TRANSDUCER. THIS APPROACH WILL COMPOUND THREE DIRECTIONS OF MODIFICATION TO A SIMPLE GUM NEOPRENE COMPOUND - FILLER, PLASTICIZER, AND PARTIAL POLYMER REPLACEMENT. A TOTAL OF 16 COMPOUNDS WILL BE DEVELOPED AND EVALUATED FOR HYSTERESIS AS WELL AS OTHER PHYSICAL PROPERTIES.

CAPE COD RESEARCH INC
PO BOX 600
BUZZARDS BAY, MA 02532
CONTRACT NUMBER:
FRANCIS L KEOHAN
TITLE:
THERMAL CONDUCTING PLASTICS
TOPIC# 203 OFFICE: NUSC

A NONMETALLIC MATERIAL IS PROPOSED THAT CAN BE USED TO MANUFACTURE COATINGS OR COMPLETE SECTIONS OF HEAT EXCHANGERS WHICH ARE SUBMERGED IN SALTWATER FOR LONG PERIODS OF TIME. THE PROPOSED MATERIAL SHOULD BE RESISTANT TO THE SEAWATER EXPOSURE AND AT THE SAME TIME HAVE A THERMAL CONDUCTIVITY EXCEEDING 30 W/m-oC.

CARVER-BACH
883 SANTA CRUZ AVE
MENLO PARK, CA 94025
CONTRACT NUMBER:
ROBERT L CARGILL
TITLE:
ON-BOARD REAL-TIME MONITORING OF HELICOPTER CONDITION
TOPIC# 101 OFFICE: NAVAIR

SUBMITTED BY

THIS PHASE I PROJECT WILL DEMONSTRATE THE FEASIBILITY OF AN ON-BOARD EXPERT SYSTEM FOR VIBRATION MONITORING AND CONDITION ASSESSMENT OF HELICOPTER PROPULSION SYSTEMS; COMPUTERIZED DATA ACQUISITION AND ANALYSIS WILL BE ACCOMPLISHED WITH EQUIPMENT AND SOFTWARE CURRENTLY UNDER DEVELOPMENT FOR COMMERCIAL ROTARY WING AIRCRAFT. IN-FLIGHT VIBRATION MONITORING UTILIZING A PORTABLE COMPUTER WILL FOCUS ON A CRITICAL PROPULSION COMPONENT IN ORDER TO DEMONSTRATE AUTONOMOUS MAINTENANCE DATA TRENDING AND DIAGNOSTIC TECHNIQUES. A CONCEPTUAL DESIGN WILL BE DEVELOPED FOR THE PHASE II IMPLEMENTATION OF AN EXPERT SYSTEM OPERATING IN CONJUNCTION WITH THE EXISTING ON-BOARD COMPUTER AND DATA BUS STRUCTURE.

CASTLE POINT RESEARCH TECHNOLOGIES
PO BOX 5136
HOBOKEN, NJ 07030
CONTRACT NUMBER: N00164-87-C-0236
JENNIFER CORDES
TITLE:
DETERMINATION OF THE ULTIMATE STRENGTH OF A COMPOSITE CONSIDERATION OF CRITICAL MANUFACTURING FLAWS
TOPIC# 179 OFFICE: NSWC/SSPO

THE FAILURE CRITERIA PRESENTLY USED FOR PREDICTION OF THE ULTIMATE STRENGTH OF A COMPOSITE MATERIAL ARE BASED UPON THE ASSUMPTION THAT THE COMPOSITE BEHAVES AS AN IDEAL ORTHOTROPIC MATERIAL. THIS IDEALIZATION OF COMPOSITE MATERIALS IS INCONSISTENT WITH THE WAY BRITTLE COMPOSITE MATERIALS FAIL. SINCE FAILURE GENERALLY BEGINS AT A SMALL CRACK OR VOID A FAILUTE CRITERIA BASED UPON A CRITICAL FLAW SIZE AND THE LIKELIHOOD OF CRACK PROPAGATION IS PROPOSED. DEVELOPMENT OF THE CRITERIA WILL BE IMPLEMENTED TO TWO PHASES. DURING PHASE I, THE ANALYTIC METHODS REQUIRED TO PREDICT CRACK PROPAGATION IN COMPOSITE MATERIALS UNDER A VARIETY OF LOADING CONDITIONS WILL BE DEVELOPED. THE TECHNIQUE IS BASED UPON THE "FICTITIOUS CRACK" METHOD AND WILL BE DEVELOPED FOR USE WITH GENERAL-PURPOSE FINITE ELEMENT PROGRAM. THIS METHOD CAN PREDICT CRACK INITIATION AND PROPAGATION AROUND A VARIETY OF EXISTING FLAW SHAPES. THE TECHNIQUE WILL BE DEVELOPED AND TESTED FOR EXTERNAL FORCES PARALLEL AND PERPENDICULAR TO THE FIBER DIRECTION. PHASE II WILL INCLUDE DEVELOPMENT AND VERIFICATION OF AN ULTIMATE STRENGTH CRITERIA BASED UPON THE RESEARCH ACCOMPLISHED BY

SUBMITTED BY

PHASE I.

CENTRA TECHNOLOGY INC
3204 MONROE ST - STE 300
ROCKVILLE, MD 20852
CONTRACT NUMBER:
JON S HOYLE
TITLE:
USE OF MILLIMETER-WAVE TECHNOLOGY IN NAVAL SHIPBORNE R
APPLICATIONS
TOPIC# 72 OFFICE: NAVSEA

THE U.S. NAVY MUST CONTINUALLY IMPROVE AND EXPAND THE CAPABILITIES OF SHIPBOARD COMBAT SYSTEMS TO MEET EXPANDING AND INCREASINGLY SOPHISTICATED THREATS. THESE INCLUDE DIFFICULT TO DETECT LOW OBSERVABLE TARGETS (LOT) AND LOW-FLYERS WHICH REMAIN UNDETECTED UNTIL THEY REACH THE RADAR HORIZON. MILLIMETER (MM)-WAVES REPRESENT A GROWING TECHNOLOGY WHICH OFFERS POTENTIAL SOLUTIONS TO SOME OF THE DIFFICULTIES POSED BY THE LOW FLYER/LOT THREAT. CENTRA WILL DESIGN AND ANALYZE MILLIMETER-WAVE RADAR SYSTEMS FOR DETECTION, TRACK, AND ID OF LOW FLYING AND LOW OBSERVABLE TARGETS. THIS PROJECT WILL ALSO IDENTIFY ANY EXISTING MILLIMETER-WAVE RADAR SYSTEMS WHICH CAN BE MODIFIED FOR SHIPBOARD USE TO DETECT AND TRACK LOW FLYING TARGETS. THE RESULTS OF THIS PROJECT WILL BE PERFORMANCE REQUIREMENTS AND DESIGN PARAMETERS FOR POTENTIAL MILLIMETER-WAVE RADAR SYSTEMS, AND RECOMMENDATIONS CONCERNING NECESSARY MODIFICATIONS TO BE MADE TO EXISTING SYSTEMS AS WELL AS PERFORMANCE PREDICTIONS FOR EACH CANDIDATE SYSTEM.

CERAMATEC INC
2425 S 900RD W
SALT LAKE CITY, UT 84119
CONTRACT NUMBER:
DAVID W RICHERSON
TITLE:
HYPERSONIC RAMJET LEADING EDGE MATERIALS DEVELOPMENT
TOPIC# 137 OFFICE: NSWC

CERAMATEC HAS CONDUCTED EXPLORATORY RESEARCH AND DEVELOPMENT ON

SUBMITTED BY

MONOLITHIC AND COMPOSITE MATERIALS IN THE ZrB2 AND TiB2 SYSTEMS AND HAS OBTAINED VERY ENCOURAGING RESULTS WITH SEVERAL PROPRIETARY COMPOSITIONS/CONSTRUCTIONS. THE AVERAGE STRENGTH OF A BASELINE TiB2 COMPOSITION WAS MEASURED AT 877 MPa (127.3 KSI). COMPOSITE STRUCTURES WITH DISCONTINUOUS REINFORCEMENT HAD STRENGTHS IN THE RANGE 400-600 MPa. INITIAL COMPOSITES WITH CONTINUOUS FIBER REINFORCEMENT HAD STRENGTHS AROUND 300 MPa AND FRACTURED IN A NON-CATASTROPHIC COMPOSITE MODE. SAMPLES OF SEVERAL COMPOSITIONS SURVIVED SEVERE THERMAL TRANSIENTS, TEMPERATURES GREATER THAN 4500 DEG F AND HIGH VELOCITY ABRASIVE PARTICLE IMPINGEMENT IN A ROCKET NOZZLE ENVIRONMENT. CERAMATEC PROPOSES TO USE THIS AND OTHER PROPRIETARY MATERIALS TECHNOLOGY AS A BASELINE FOR DEVELOPMENT OF A LEADING EDGE WITH A RADIUS OF 0.030 INCH FOR AN ADVANCED HYPERSONIC VEHICLE. THE PHASE I EFFORT WILL INCLUDE MATERIAL SCREENING AND SELECTION BASED ON FABRICATION OF CROSS SECTIONS UP TO 0.25 INCH THICK, FOLLOWED BY SHAPE FORMING DEVELOPMENT TO ACHIEVE THE 0.030 INCH RADIUS LEADING EDGE.

CERAMATEC INC
2425 S 900RD W
SALT LAKE CITY, UT 84119
CONTRACT NUMBER:
DAVID W RICHERSON
TITLE:
FRACTOGRAPHY OF ADVANCED SILICON NITRIDE MATERIAL FOR APPLICATIONS
TOPIC# 81 OFFICE: NAVSEA

SOME CERAMICS HAVE VERY HIGH TEMPERATURE STABILITY AND STRENGTH COMPARED TO STRUCTURAL METALS AND HAVE POTENTIAL TO BE USED UNCOOLED IN ADVANCED GAS TURBINE ENGINES. ONE CANDIDATE FAMILY OF CERAMICS WITH AN ESPECIALLY GOOD COMBINATION OF THERMAL PROPERTIES AND POTENTIAL MECHANICAL PROPERTIES IS SILICON NITRIDE. RECENTLY DEVELOPED ALLOYS OF SILICON NITRIDE LOOK PARTICULARLY PROMISING, BUT REQUIRE FURTHER CHARACTERIZATION TO MAKE A REASONABLE ASSESSMENT. THE HIP SILICON NITRIDE FROM NORTON COMPANY IS PROPOSED AS AN INITIAL CANDIDATE FOR EVALUATION. THE EVALUATION WILL CONSIST OF STRENGTH TESTING OF AS-FABRICATED AND THERMALLY-AGED TEST BARS AND CONDUCTING DETAILED FRACTURE ANALYSIS TO DETERMINE THE STRENGTH-LIMITING CHARACTERISTICS OF THE MATERIAL. THIS INFORMATION WILL THEN BE USED TO ASSESS THE

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POTENTIAL FOR FURTHER IMPROVEMENT OF MONOLITHIC SILICON NITRIDE AND THE FEASIBILITY OF RELIABLE OPERATION UNDER GAS TURBINE CONDITIONS. THE ASSESSMENT WILL CONSIDER CERAMIC COMPOSITES AS AN ALTERNATIVE AND RESISTANCE TO CRACK PROPAGATION AS AN ALTERNATIVE TO RESISTANCE TO CRACK INITIATION.

CHOPP COMPUTER CORP
1012 PROSPECT ST - #300
LA JOLLA, CA 92037
CONTRACT NUMBER:
LEE HIGBIE
TITLE:
INTEGRATED SYSTEM FOR NUMERIC AND SYMBOLIC COMPUTATION
TOPIC# 159 OFFICE: NSWC

THE PROPOSED TASKS ARE TO INVESTIGATE THE COMPUTER FEATURES NECESSARY TO PROVIDE HIGH PERFORMANCE COMBINED NUMERIC AND SYMBOLIC PROCESSING. THIS EFFORT USES THE CHOPP SUPERCOMPUTER ARCHITECTURE AS THE TARGET MACHINE. CHOPP IS A RECENT BREAKTHROUGH IN THE ORGANIZATION OF GENERAL PURPOSE COMPUTERS FOR NUMERICAL PERFORMANCE AT THE HIGHEST LEVEL. A SINGLE NODE OF THE CONVENTIONAL TECHNOLOGY CHOPP 1 IS A UNIPROCESSOR THAT HAS FOUR TIMES THE THROUGHPUT OF THE CRAY X-MP FOR SEQUENTIAL LIVERMORE LOOPS BENCHMARKS. THIS DEMONSTRATES THAT THE ARCHITECTURE IS AN INNOVATIVE BREAKTHROUGH. CHOPP COMPUTER CORPORATION DEVELOPS AND SELLS FOUR TO SIXTEEN PROCESSOR, AIR-COOLED SUPERCOMPUTERS BASED UPON THE INNOVATIVE CHOPP ARCHITECTURE. EVALUATION OF CHOPP HARDWARE AND LANGUAGE FOR SYMBOLIC PROCESSING DETERMINES THE EXPECTED PERFORMANCE, VALUE AND EFFORT NECESSARY TO PRODUCE A COMBINED SYMBOLIC AND NUMERIC CHOPP COMPUTER.

COLEMAN RESEARCH CORP
5950 LAKEHURST DR
ORLANDO, FL 32819
CONTRACT NUMBER:
DR WILLIAM STEINWAY
TITLE:
GROUND PENETRATING RADAR
TOPIC# 224 OFFICE: NCEL/NAVFAC

SUBMITTED BY

THE OBJECTIVE OF THE STUDY EFFORT IS TO PRODUCE COMPLETE SPECIFICATIONS, A DETAILED DESIGN, AND PERFORMANCE CALCULATIONS FOR A 'FREQUENCY-STEPPED' GROUND PENETRATING RADAR (GPR) SYSTEM. THE FREQUENCY STEPPED APPROACH WILL ALLOW IMPROVEMENTS OVER THE TYPICAL 'SHORT-PULSE' RADAR BY IMPROVING BANDWIDTH CONTROL, IMPEDANCE MISMATCH COMPENSATION, HIGHER OUTPUT POWER, AND COHERENT INTEGRATION AND IMAGE PROCESSING TECHNIQUES. THE APPROACH WILL DETAIL DESIGN TO THE CIRCUIT LEVEL, SPECIFY TOLERANCES AND SIGNAL CHARACTERISTICS, AND IDENTIFY CRITICAL COMPONENTS OR SUBASSEMBLIES. PERFORMANCE CALCULATIONS WILL INCLUDE SOIL VARIATIONS, LOSSES, SOURCES OF ERROR, AND COMPONENT VARIATIONS. AN IMPROVED GPR WILL BE ABLE TO LOCATE UNDERGROUND UTILITY LINES AND OTHER MANMADE AND NATURALLY OCCURRING OBJECTS (METALLIC AND NON-METALLIC) IN THE GROUND PROFILE TO A DEPTH OF GREATER THAN TWENTY FEET. A-PRIORI KNOWLEDGE OF GROUND CONDITIONS IS ESSENTIAL TO THE SUCCESSFUL AND ECONOMICAL COMPLETION OF CONSTRUCTION PROJECTS. KNOWLEDGE OF SUB-SURFACE CONDITIONS POSSIBLY IS THE KEY TO SIGNIFICANT COST REDUCTIONS IN HEAVY CONSTRUCTION PROGRAMS.

COLLABORATION IN SCIENCE & TECH INC
PO BOX 218189
HOUSTON, TX 77218
CONTRACT NUMBER:
DR J Y CHUNG
TITLE:
THREE DIMENSIONAL UNDERWATER ACOUSTIC INTENSITY MEASUR
TOPIC# 66 OFFICE: NAVSEA

IN THIS PROJECT, AN ADVANCED UNDERWATER ACOUSTIC INTENSITY MEASUREMENT SYSTEM WILL BE DESIGNED, BUILT AND TESTED. THIS SYSTEM CONSISTS OF A MULTI-SENSOR PROBE-TYPE ARRAY, A REAL-TIME SPECTRUM ANALYZER AND A MINI-COMPUTER SYSTEM WITH BUILT-IN IN-SITU CALIBRATION CAPABILITY. THE SYSTEM IS CAPABLE OF MEASURING, DISPLAYING, AND MEMORIZING: (a) THREE ORTHOGONAL ACOUSTIC INTENSITY VECTORS AND THE TOTAL ACOUSTIC INTENSITY VECTOR, (b) THREE ORTHOGONAL ACOUSTIC VELOCITY VECTORS AND THE TOTAL VELOCITY VECTOR, (c) ACOUSTIC PRESSURE, (d) ACOUSTIC IMPEDANCE, AND (e) ACOUSTIC INTENSITY CONTOUR MAP. THE MEASUREMENT GRID POINTS CAN BE INPUTTED TO THE SYSTEM FOR POST DATA PROCESSING PURPOSES. THE STORED DATA OF PRESSURE, VELOCITY, IMPEDANCE AND INTENSITY TAKEN AT A GREAT NUMBER OF GRID POINTS AROUND AN OBJECT CAN

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BE STORED IN MEMORY TO BE RETRIEVED LATER FOR USE IN CONJUNCTION WITH, E.G., HELMHOLTZ INTEGRAL PROBLEMS, HOLOGRAPHY AND SOUND FIELD RECONSTRUCTION PROBLEMS.

COMPU SYSTEMS CORP
PO BOX 848 - 1604 GRAND AVE
LARAMIE, WY 82070
CONTRACT NUMBER:
THEODORE J PEPIN
TITLE:
CASE FOR CONTROLLERS
TOPIC# 148 OFFICE: NSWC

THIS PHASE I PROPOSAL IS FOR THE DESIGN OF THE GENERAL PURPOSE CASE SYSTEM THAT WILL AID IN THE DEVELOPMENT OF FIRMWARE AND SOFTWARE FOR GENERAL PURPOSE CONTROLLERS. THE LONG-TERM OBJECTIVE OF THE PROPOSED RESEARCH IS THE DEVELOPMENT OF A PERSONAL COMPUTER, PC, BASED SYSTEM THAT WILL ALLOW KNOWLEDGEABLE APPLICATION ENGINEERS TO CREATE THE FIRMWARE FOR A GENERAL PURPOSE CONTROLLER.

COMPUTATIONAL MECHANICS CORP
3601 A CHAPMAN HWY
KNOXVILLE, TN 37920
CONTRACT NUMBER:
DR A J BAKER
TITLE:
A ROBUST UNSTEADY INCOMPRESSIBLE NAVIER STOKES CODE
TOPIC# 199 OFFICE: NUSC

THE MISSION OF THIS PHASE I PROJECT IS TO DEVELOP A ROBUST AND ACCURATE COMPUTER CODE FOR PREDICTING INCOMPRESSIBLE TRANSIENT TURBULENT FLOWFIELDS USING AN INTEGRAL (FINITE VOLUME) TECHNIQUE. THE CODE WILL BE APPLICABLE TO BOTH EXTERNAL AND INTERNAL FLOW GEOMETRIES, WILL BE CONSTRUCTED IN A GENERALIZED COORDINATES FRAMEWORK, BE OPERABLE EITHER FULLY ELLIPTIC OR PARABOLIC-ELLIPTIC, AND POSSESS A TWO EQUATION K-E CLOSURE SYSTEM WITH ALGEBRAIC REYNOLDS STRESS TENSOR MODEL. COMPARISONS TO AVAILABLE CRITICAL EXPERIMENTAL DATA WILL BE CREATED, AND THE CODE WILL BE DELIVERED OPERABLE FOR A VAX 11/78

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ENVIRONMENT. THE CFD THEORY WILL ACCURATELY SIMULATE UNBOUNDED ACOUSTIC SPEED, WILL EXHIBIT ROBUST CONTROL OF ALL ARTIFICIAL DIFFUSION MECHANISMS, WILL EMPLOY A VARIABLE IMPLICIT TIME-INTEGRATION PROCEDURE AND WILL FUNCTION ON AN EFFICIENT TENSOR PRODUCT FACTORIZATION OF THE LINEAR ALGEBRA JACOBIAN.

COMPUTER COMMAND & CONTROL CO
2401 WALNUT ST - STE 402
PHILADELPHIA, PA 19103
CONTRACT NUMBER:
EVAN LOCK
TITLE:
SOFTWARE ENGINEERING ENVIRONMENT FOR PARALLEL AND DIST SYSTEMS
TOPIC# 158 OFFICE: NSWC

THE OBJECTIVE IS TO PROVIDE AN EASY-TO-USE SOFTWARE/HARDWARE ENVIRONMENT FOR DEVELOPING, DEBUGGING AND TESTING OF MESSAGE BASED PARALLEL AND DISTRIBUTED SYSTEMS. SUCH HARDWARE EXISTS WIDELY; IT RANGES FROM WORKSTATIONS (VAX, SUN, ETC.) CONNECTED BY A LOCAL AREA NETWORK (LAN) TO SPECIAL ARCHITECTURE (BBN'S BUTTERFLY, ETC.). THE DEVELOPER OF PARALLEL/DISTRIBUTED APPLICATIONS NEEDS TO DEVELOP AND RUN HIS/HER SOFTWARE ON PARALLEL/DISTRIBUTED HARDWARE. IN MILITARY APPLICATIONS, THIS IS NECESSARY PRIOR TO FINAL INSTALLATION ON SPECIALIZED (MILITARIZED) HARDWARE. THE USE OF EXISTING HARDWARE AND OPERATING SYSTEMS IS TOO COMPLEX. WE PROPOSE TO PROVIDE A SOFTWARE DEVELOPMENT ENVIRONMENT, THAT IS BASED ON THE MODEL SYSTEM OFFERED BY CCCC, TO MAKE THIS TASK AS EASY AS CONVENTIONAL PROGRAM DEVELOPMENT. THE USER WOULD DEVELOP SEQUENTIAL PROGRAMS FOR INDIVIDUAL PROCESSES, IN LANGUAGE OF OWN CHOICE, AND INDICATE THE NEEDED PATHS FOR MESSAGE COMMUNICATIONS AMONG PROCESSES. THE PROPOSED DEVELOPMENT ENVIRONMENT WILL LOAD THE PROGRAMS, SET UP THEIR INTERCOMMUNICATIONS, EXECUTE THEM IN PARALLEL AND PROVIDE TEST DATA.

CONAX BUFFALO CORP
2300 WALDEN AVE
BUFFALO, NY 14225
CONTRACT NUMBER:
DR GEORGE W TREGAY
TITLE:
HIGH PRESSURE OPTICAL PENETRATOR FOR SINGLE MODE FIBER
TOPIC# 236 OFFICE: NOSC/NAVSEA

SUBMITTED BY

CONAX HAS EXTENDED THE EXPERIENCE GAINED IN 14 YEARS OF ENGINEERING AND MANUFACTURING ELECTRICAL PENETRATORS TO SEALING DEVICES FOR FIBER OPTICS. FIBER OPTIC PENETRATORS WITH A TOTAL OPTICAL LOSS OF 0.3 dB AT 10,000 PSI HAVE BEEN DEMONSTRATED. AN INNOVATIVE USE OF COMPRESSIVE SEALING IS PROPOSED TO DEVELOP A PENETRATOR FOR SINGLE MODE FIBER WHICH IS MORE RUGGED AND HAS A WIDER OPERATING TEMPERATURE RANGE THAN APPROACHES USING BONDED SEALS. THE KEY PERFORMANCE OBJECTIVES ARE: COMPRESSIVE SEALING - 10,000 PSI PRESSURE DIFFERENTIAL WITH TOTAL INSERTION LOSS OF LESS THAN 2dB RELATIVE TO A SHORT REFERENCE CABLE WITH EQUIVALENT CONNECTORS. CONNECTORS - RIGIDLY ATTACHED TO THE PENETRATOR WITH NO INCREASE IN INSERTION LOSS WITH 100 MATING CYCLES. FOUR PENETRATORS WILL BE FABRICATED USING TWO DESIGN CONCEPTS. THE ATTENUATION AT THE SEAL WILL BE MEASURED WITH AN OPTICAL TIME DOMAIN REFLECTOMETER AND THE INSERTION LOSS MEASURED FOR THE PENETRATOR/CONNECTORS ASSEMBLY.

CONCEPT ANALYSIS CORP
9145 GENERAL CT
PLYMOUTH, MI 48170
CONTRACT NUMBER: N00164-87-C-0234
DR JAYANT MAHISHI
TITLE:
FRACTURE TOUGHNESS CHARACTERIZATION OF FIBER-REINFORCE
TOPIC# 179 OFFICE: NWSC/SSPO

CONCEPT ANALYSIS CORPORATION (CAC) PROPOSES TO DEVELOP A NEW ANALYTICAL APPROACH FOR THE FRACTURE CHARACTERIZATION OF FIBER-REINFORCED COMPOSITES. THE BASIC PHYSICAL FAILURE MODES IN THE FORM OF; FIBER BREAKAGE, MATRIX CRACKS, FIBER-MATRIX INTERFACE DEBOND, FIBER PULLOUT, AND MATRIX YIELDING (WHICH ARE CHARACTERISTICS OF THESE HETEROGENEOUS MATERIALS) WILL BE TAKEN INTO ACCOUNT BY PERFORMING A MICROMECHANICS ANALYSIS OF THE FIBER-REINFORCED COMPOSITE. A 3-DIMENSIONAL ELASTOPLATIC, GENERAL ORTHOTROPIC FINITE ELEMENT CODE WITH CRACK INITIATION AND PROPAGATION CAPABILITY (WHICH IS AVAILABLE ON CAC'S VOX AND CELERITY COMPUTERS) WILL BE EMPLOYED FOR THE ANALYSIS. THE CRACK PROPAGATION CAPABILITY DEVELOPED BY THE PRINCIPAL INVESTIGATOR IS BASED ON THE VIRTUAL CRACK EXTENSION METHOD. THE MICROMECHANICS ANALYSIS WILL PREDICT THE FRACTURE TOUGHNESS OF THE UNI-DIRECTIONAL LAMINA AS A FUNCTION OF THE ENERGY RELEASE RATE COR-

SUBMITTED BY

RESPONDING TO THE ONSET OF UNSTABLE CRACK GROWTH FROM MICROSCOPIC FLAWS. A RELATION BETWEEN SIZE AND DENSITY OF MICROSCOPIC FLAWS IN THE FORM OF BROKEN FIBERS, MATRIX-CRACKS, FIBER-MATRIX INTERFACE DEBOND, AND THE FRACTURE TOUGHNESS OF THE FIBER-REINFORCED COMPOSITE WILL BE ESTABLISHED. THE INFLUENCE OF THE MATRIX MATERIAL DUCTILITY AND THE THERMAL RESIDUAL STRESSES DUE TO THE MANUFACTURING PROCESS ON THE FRACTURE TOUGHNESS OF THE COMPOSITE WILL BE STUDIED.

CONCEPTS ETI INC
PO BOX 643 - MAIN ST
NORWICH, VT 05055
CONTRACT NUMBER:
DR DAVID JAPIKSE
TITLE:
REDUCED DIAMETER CENTRIFUGAL IMPELLER DIFFUSER INVESTI
TOPIC# 226 OFFICE: NAPC/NAVAIR

THIS INVESTIGATION EVALUATES A MULTI-ROW STRAIGHT CHANNEL DIFFUSER, A MULTI-ROW CASCADE (AIRFOIL) DIFFUSER, AND A MULTI-ROW DIFFUSER WITH A BEND TO AXIAL, IN ORDER TO CHOOSE THE BEST COMPONENTS NEEDED TO MEET AIRCRAFT RESTRICTED DIAMETER DESIGN REQUIREMENTS. THE SYSTEMATIC DESIGN, FABRICATION AND TEST INCLUDES COMPARISON TO BACKGROUND DATA SETS, AND DETAILED TRAVERSE AND LASER MEASUREMENTS AS WARRENTED. IT IS EXPECTED THAT A DEFINITIVE PREFERENCE FOR THE CHANNEL OR CASCADE DIFFUSER WILL RESULT, THAT BASIC DATA ON RATE OF DIFFUSION WILL BE OBTAINED, THAT ENHANCEMENTS ON THE BEND TO AIXAL WILL BE INTRODUCED IN THE FORM OF FLOW CONTROL, AND THAT THESE TESTS WILL PAVE THE WAY TOWARDS DEFINING OPTIMUM AIRCRAFT ENGINE COMPACT DIFFUSER SYSTEMS. TESTING WILL BE CONDUCTED IN A WELL CALIBRATED, SMALL-SCALE COMPRESSOR STAGE WITH INLET MACH NUMBERS OF ABOUT 1.1.

CREARE INC
PO BOX 71 - ETNA RD
HANOVER, NH 03755
CONTRACT NUMBER:
WALTER L SWIFT
TITLE:
SELF-CONTAINED CIRCULATOR FOR PORTABLE PERSONAL COOLIN
TOPIC# 91 OFFICE: NAVSUP

SUBMITTED BY

PERSONAL COOLING SYSTEMS REQUIRE PORTABLE COMPACT PUMPING UNITS WHICH PROVIDE MODERATE DIFFERENTIAL PRESSURES AT LOW FLOW RATES. SUCH CIRCULATORS DO NOT PRESENTLY EXIST. THIS PROPOSAL DESCRIBES A DEVELOPMENT PROGRAM TO PRODUCE A SELF-CONTAINED CIRCULATOR COMPLETE WITH ITS OWN POWER UNIT. THIS CIRCULATOR WILL DELIVER 200 lbm/HR OF WATER OF 20 PSIG. THE RECHARGEABLE POWER UNIT WILL PROVIDE FOR SIX HOURS OF CONTINUOUS OPERATION. THE REDUCTION OF OVERALL SIZE AND WEIGHT OF THE UNIT WILL BE OF PRIMARY IMPORTANCE IN THE DESIGN.

CRYSTAL SYSTEMS INC
27 CONGRESS ST
SALEM, MA 01970
CONTRACT NUMBER:
CHANDRA P KHATTAK
TITLE:
GROWTH OF HIGH OPTICAL QUALITY BaTiO3 PHOTOREFRACTIVE CRYSTALS
TOPIC# 139 OFFICE: NSWC

THE INTENT OF THE PRESENT PROPOSAL IS TO DEMONSTRATE THAT HIGH OPTICAL QUALITY BaTiO3 SINGLE CRYSTALS CAN BE SECURED BY ADAPTING THE HEAT EXCHANGER METHOD (HEM[TM]) OF CRYSTAL GROWTH TO HIGH TEMPERATURE SOLUTION GROWTH. THE PHASE I CRYSTALLIZATIONS WILL BE CONDUCTED FROM A BARIUM BORATE SOLUTION (BaB2O4). BARIUM TITANATE IS KNOWN TO CRYSTALLIZE FROM THIS SOLUTION. THE MINIMUM TEMPERATURE AVAILABLE WITH THIS FLUX IS 942 DEG CENTIGRADE. THE LARGE TEMPERATURE RANGE OF THIS FLUX SYSTEM AND THE EASE WITH WHICH FOREIGN IONS MAY BE INTRODUCED INTO BaTiO3 SUCH THAT THE MATERIAL PARAMETERS EFFECTIVE IN PHASE CONJUGATION (PC) AND FOUR WAVE MIXING (FWM) CAN BE STUDIED. THE PROPOSED APPROACH WILL ALLOW PRODUCTION OF MUCH LARGER CRYSTALS WITH THE REQUIRED OPTICAL QUALITY THAN THOSE CURRENTLY AVAILABLE. THE ADAPTATION OF HEM CRYSTAL GROWTH TO HIGH TEMPERATURE SOLUTION GROWTH IS EXPECTED TO PROVIDE THE NECESSARY PROCESS CONTROL FOR THE PRODUCTION OF HIGH OPTICAL QUALITY SINGLE CRYSTALS: AN ABSOLUTE REQUIREMENT FOR PC AND FWM REGARDLESS OF THE MATERIAL'S FUNDAMENTAL CONSTANTS.

CRYSTAL SYSTEMS INC
27 CONGRESS ST - SHETLAND INDUSTRIAL PK
SALEM, MA 01970
CONTRACT NUMBER: N60530-88-C-0076
CHANDRA P KHATTAK
TITLE:
GROWTH OF NEAR NET SHAPE SAPPHIRE DOMES USING THE HEAT METHOD
TOPIC# 171 OFFICE: NWC/NAVAIR

SUBMITTED BY

ON THE BASIS OF PERFORMANCE, SAPPHIRE IS ONE OF THE BEST MATERIALS FOR MISSILE DOME APPLICATIONS. HOWEVER, BOULE UTILIZATION AND HIGH FABRICATION COSTS MAKE IT AN EXPENSIVE CHOICE, AND, THEREFORE, NO U.S. MISSILE PRODUCTION PROGRAMS ARE USING SAPPHIRE DOMES. IT IS DESIRABLE TO GROW NEAR NET-SHAPE SAPPHIRE DOMES FOR MISSILE APPLICATIONS. IT HAS BEEN DEMONSTRATED THAT WHEN MOLYBDENUM SHEETS ARE PLACED IN THE MELT AND SAPPHIRE GROWTH IS CARRIED OUT USING THE HEAT EXCHANGER METHOD, SINGLE CRYSTAL GROWTH IS ACHIEVED IN SPITE OF SUCH PERTURBATION. WHEN DOME-SHAPED MOLYBDENUM PREFORMS WERE NESTED TOGETHER TO PRODUCE SAPPHIRE DOME BLANKS, HIGH OPTICAL QUALITY WAS PRODUCED. HOWEVER, THESE BLANKS WERE CRACKED. THE OBJECTIVE OF THE PHASE I PROGRAM WILL BE TO IDENTIFY THE CAUSE OF CRACKING AND TO DEMONSTRATE THAT CRACK-FREE, DOME-SHAPED SAPPHIRE BLANKS CAN BE PRODUCED DIRECTLY FROM THE MELT.

CUSHING ASSOCS INC
111 GIBRALTER ST
ANNAPOLIS, MD 21401
CONTRACT NUMBER:
DR VINCENT J CUSING
TITLE:
OBSTRUCTIONLESS FLOWMETER
TOPIC# 79 OFFICE: NAVSEA

FOR THE ELECTROMAGNETIC FLOWMETER IT HAS BEEN THEORETICALLY AND EXPERIMENTALLY ESTABLISHED THAT THE FLOW-GENERATED VOLTAGE IS THE SAME WHETHER METERING CONDUCTIVE OR INSULATING LIQUIDS. IT HAS FURTHER BEEN THEORETICALLY AND EXPERIMENTALLY ESTABLISHED THAT THE EM FLOWMETER OPERATES OPTIONALLY AS A VOLUMETRIC FLOWMETER OR AS A MASS FLOWMETER FOR INSULATING LIQUIDS, SUCH AS PETROLEUM PRODUCTS, WHERE THE MOLECULES ARE EFFECTIVELY NONPOLAR. THE LIMITATION TO DATE WITH INSULATING LIQUIDS IS ELECTRICAL INTERFERENCE OWING TO TRIBOELECTRICITY IN A TURBULENTLY FLOWING LIQUID. THE PROPOSED EFFORT SEEKS TO PROVIDE A SIGNAL CONDITIONER WHICH WILL PROVIDE ADEQUTE REJECTION OF SUCH INTERFERENCE. THIS APPEARS FEASIBLE TODAY IN LIGHT OF (1) STATE OF THE ART IN DIGITAL VOICE AND MICROPROCESSORS, AND (2) INSIGHTS INTO THE STRUCTURE AND SPECTRUM(S) OF TRIBOELECTRICITY. SUCCESS WILL ALLOW THE EM FLOWMETER TO OPERATE INDISCRIMINATELY WITH ANY SOLID OR LIQUID THAT CAN BE PUMPED OR EXTRUDED.

SUBMITTED BY

DATASONICS INC
PO BOX 8 - 1400 RTE 28A
CATAUMET, MA 02534
CONTRACT NUMBER:
WILLIAM L DALTON
TITLE:
UNDERWATER DIGITAL ACOUSTIC TELEMETRY SYSTEM
TOPIC# 196 OFFICE: NUSC

THERE IS A NEED FOR A HIGH DATA RATE UNDERWATER ACOUSTIC TELEMETRY SYSTEM WHICH WILL OPERATE AT A HIGH RATE OF DATA OR VOICE TRANSMISSION IN A REVERBERENT, MULTIPATH ENVIRONMENT. THIS PROPOSAL DESCRIBES A SYSTEM CONCEPT WHICH, IF SUCCESSFULLY IMPLEMENTED, WILL ALLOW TRANSMISSION OF DATA AT RATES UP TO 4800 BITS PER SECOND OVER A HIGHLY REVERBERENT, SHALLOW UNDERWATER PATH. THE PROPOSED TECHNIQUE WILL MAKE USE OF SPREAD SPECTRUM AND DIRECTIONAL TRANSMISSION TECHNIQUES TO OVERCOME THE DEGRADING EFFECTS OF SIGNAL DISTORTION CAUSED BY ACOUSTIC MULTIPATH NORMALLY ENCOUNTERED IN THIS TYPE OF OPERATING ENVIRONMENT. INTERNAL DATA PROCESSING WILL ALLOW INTERFACING OF THE ACOUSTIC LINK WITH MOORED INSTRUMENTS, ANALOG SENSORS, OR VOICE INPUT IN A MANNER WHICH WILL ALLOW REMOTE RECOVERY OF DATA IN A TIMELY, RELIABLE MANNER. PROPOSED PHASE I RESEARCH INCLUDES THE FIELD TESTING, AND VERIFICATION OF SYSTEM CONCEPTS WHICH WILL LEAD TO SPECIFICATIONS AND SYSTEM DEVELOPMENT TO BE CONDUCTED AS PART OF PHASE II.

DCS CORP
1055 N FAIRFAX ST
ALEXANDRIA, VA 22314
CONTRACT NUMBER:
CLINTON THACKER
TITLE:
CV FIXED WING AIRCRAFT TRACKING AND SURVEILLANCE SYSTE
TOPIC# 208 OFFICE: NAEC/NAVAIR

THE LANDING OF AIRCRAFT ABOARD CARRIERS AT SEA IS ONE OF THE MOST DANGEROUS OF MILITARY OPERATIONS. THE DANGER IS COMPOUND MANY-FOLD

SUBMITTED BY

WHEN RECOVERIES ARE CARRIED OUT AT NIGHT DURING EMCON CONDITIONS. WITHOUT THE SHIP'S RADAR OR FREE RADIO COMMUNICATION WITH PILOTS, A SHIP-BASED SENSOR IS REQUIRED THAT CAN GIVE GLIDE SLOPE INFORMATION TO THE LSO AS WELL AS ALLOW VERIFICATION OF AIRCRAFT TYPE AND LANDING CONFIGURATION. DCS PROPOSES TO EXAMINE TECHNIQUES AND EQUIPMENT WHICH CAN PROVIDE THE NECESSARY LANDING DATA AND TO RECOMMEND THE MOST PROMISING SOLUTIONS. THIS WILL BE DONE BY FIRST EXAMING CURRENT OPERATIONS AND THE ADVANTAGES AND DISADVANTAGES OF THE CARTS (FLIR/LASER) SYSTEM. ALTERNATIVES TO CARTS, SUCH AS OTHER DESIGNS OR OPERATIONAL USES, AND OTHER TECHNOLOGIES (MMW, LIDAR) WILL THEN BE ANALYZED. DCS WILL PERFORM ENGINEERING TRADE STUDIES TO EVALUATE CANDIDATE SOLUTIONS FOR PERFORMANCE, COST DEVELOPMENT RISK (MATURITY) AND LIFE CYCLE SUPPORT CONSIDERATIONS. AN OPTIMIZED SYSTEM ARCHITECTURE WILL BE HYPOTHESIZED TO MEET REQUIREMENTS FOR A LONG RANGE NIGHTTIME LANDING AID SYSTEM.

DECEL INC
1665 LEXINGTON AVE - STE #105
DeLAND, FL 32720
CONTRACT NUMBER: M00027-87-C-0073
RICHARD C EMERSON
TITLE:
VARIABLE SPEED COMPATIBLE REFUELING DROGUE FOR REFUELI
FIXED/ROTOR WING AIRCRAFT
TOPIC# 23 OFFICE: MARCORPS

U.S.M.C. CURRENT MUST MAINTAIN TWO SEPARATE SYSTEMS FOR MID AIR REFUELING; A LOW SPEED SYSTEM FOR HELICOPTERS AND A HIGH SPEED SYSTEM FOR JETS. THIS STUDY PROPOSES A RETROFIT TO EACH SYSTEM FOR DUAL PURPOSE FUNCTIONS.

DECISION SCIENCE CONSORTIUM INC
7700 LEESBURG PIKE - STE 421
FALLS CHURCH, VA 22043
CONTRACT NUMBER:
JACOB W ULVILA
TITLE:
COMPUTERIZED DECISION SUPPORT FOR RESOURCE ALLOCATION
TOPIC# 253 OFFICE: NAVAIR/NATC

SUBMITTED BY

DCS PROPOSES TO DEVELOP A COMPUTER-BASED DECISION AID TO SUPPORT RESOURCE ALLOCATION DECISION MAKING IN THE RESEARCH, DEVELOPMENT, TEST, AND EVALUATION ENVIRONMENT. THIS DECISION AID WILL INCORPORATE THE BEST METHODS FOR CATEGORIZING, PRIORITIZING, AND ALLOCATING RESOURCES TO THE MOST PROMISING PROJECTS. PREVIOUS METHODOLOGIES FOR PROGRAM PLANNING HAVE TENDED TO BE NARROWLY FOCUSED ALONG TECHNICAL DISCIPLINES, NOT INTEGRATIVE ACROSS DISCIPLINES. WE PROPOSE TO COMBINE IDEAS FROM THE FIELDS OF TECHNOLOGY ASSESSMENT, DECISION ANALYSIS, PROBABILITY MODELING, OPTIMIZATION THEORY, AND PORTFOLIO THEORY INTO A UNIFIED METHODOLOGY. IN PHASE I, WE PROPOSE TO: 1) IDENTIFY IMPORTANT FACTORS THAT CONTRIBUTE TO NAVAL AIR TEST CENTER'S ASSESSMENT AND PLANNING, 2) DEVELOP AN INTEGRATIVE RESOURCE ALLOCATION METHODOLOGY, AND 3) DEVELOP AN INITIAL IMPLEMENTATION OF THE METHODOLOGY ON A MICROCOMPUTER SYSTEM. IN PHASE II, THE COMPUTERIZED IMPLEMENTATION WILL BE DEVELOPED FULLY. THE METHOD WILL BE APPLIED TO NAVAL AIR TEST CENTER'S RESOURCE ALLOCATION DECISIONS TO THE EXTENT DESIRABLE.

DECISION-SCIENCE APPLICATIONS INC
1901 N MOORE ST - STE 1000
ARLINGTON, VA 22209
CONTRACT NUMBER:
PHILIP G TOMLINSON
TITLE:
EHF FLUSH MOUNTED CONFORMAL ARRAY FOR AIRCRAFT COMMAND COMMUNICATION SYSTEMS
TOPIC# 106 OFFICE: NAVAIR/SC

THE NEED FOR LARGE, HIGH-PERFORMANCE ARRAYS ON NONPLANAR SURFACES, COUPLED WITH RECENT ADVANCES IN ELECTRONICS TECHNOLOGY, HAS RESULTED IN A RECENT SURGE OF INTEREST IN CONFORMAL ARRAYS. APPLICATIONS INCLUDE LARGE CONFORMAL ARRAYS ON AIRCRAFT FUSELAGE FOR SURVEILLANCE, ON ARTILLERY SHELLS, FOR MISSILE SEEKERS (AIR-TO-AIR, AND AIR-TO-SURFACE APPLICATIONS) AND ON REENTRY VEHICLES. CONFORMAL ARRAYS HAVE PROVEN TO BE ATTRACTIVE ALTERNATIVES TO MOUNTING EXTERNAL RADOMES ON, CUTTING HOLES IN, OR CHANGING THE SHAPES OF VEHICLES TO ACCOMMODATE AN ANTENNA. THESE ARRAYS ARE ESPECIALLY ATTRACTIVE FOR APPLICATIONS WHICH REQUIRE WIDE ANGULAR COVERAGE WHILE MINIMIZING SCAN LOSS. THE TECHNICAL OBJECTIVE OF THE PROPOSED RESEARCH IS TO CONDUCT A FEASI-

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BILITY STUDY FOR DUAL FREQUENCY CONFORMAL ARRAY CAPABLE OF SPECIFIC PERFORMANCE GOALS WHICH INCLUDE AN EXCESS OF UPPER HEMISPHERICAL COVERAGE FROM AN AIRCRAFT PLATFORM TO A SATELLITE WITH THE ARRAY ABLE TO PROVIDE A TRANSMITTING POWER IN EXCESS OF 100 W AT 44 GHz AND RECEIVING AT 20 GHz. ALSO TO BE PROVIDED IN THE STUDY, THE DESIGN SHALL PROVIDE 40 dBI GAIN AT BOTH FREQUENCIES, BE CIRCULARLY POLARIZED, WITH A BANDWIDTH LESS THAN FIVE PERCENT OF THE TRANSMITTED OR RECEIVED FREQUENCY, AND INCLUDE A STEERABLE ARRAY CAPABLE OF LOCKING ONTO A RECEIVED SIGNAL FROM A SATELLITE.

DEFENSE SYSTEMS INC
7903 WESTPARK DR
McLEAN, VA 22102
CONTRACT NUMBER:
DR GEORGE SEBESTYEN
TITLE:
COMPACT UNDERWATER BUOYANCY SYSTEM FOR EXPENDABLE SONO
TOPIC# 67 OFFICE: NAVSEA

THERE IS NEED FOR A COMPACT UNDERWATER BUOYANCY SYSTEM CAPABLE OF MAINTAINING A SPECIFIED (ABOUT 10 LB) WEIGHT AT ANY PRESET WATER DEPTH FROM 0 TO 2,000 FT. IT WOULD BE USED IN EXPENDABLE SONOBUOYS WHERE HYDROPHONES OR TRANSDUCERS MUST BE KEPT AT A PRESET DEPTH. DEFENSE SYSTEMS INC. (DSI) PROPOSES TO BUILD AND DEMONSTRATE IN PHASE I SUCH A DEVICE IN THE FORM OF AN EXPANDING, NESTED SET OF 6" DIAMETER 4" LONG CYLINDERS. UPON DEPLOYMENT AND ACTIVATION BY A SALT WATER SWITCH AND ELECTRONIC TIMER, AN INITIAL EXPANSION OF THE NESTED CYLINDERS TAKES PLACE TO COMPENSATE FOR THE PAYLOAD WEIGHT. FROM THEN ON A MICROPROCESSOR AND PRESSURE-SENSOR-CONTROLLED STEPPING MOTOR IS USED TO MICRO ADJUST CYLINDER EXPANSION TO CAUSE THE DEVICE TO CHANGE BUOYANCY, THUS MAINTAINING DEPTH AT THE PRESET LEVEL. THE BUOYANCY DEVICE USES LITTLE ELECTRIC POWER, CONTAINS NO HAZARDOUS DEVICES AND HAS A VERY LOW PROJECTED UNIT COST. IT IS FOR THIS REASON THAT DSI OFFERS A COMPLETELY FUNCTIONAL UNIT AS A PHASE I DELIVERABLE. IN PHASE II PRODUCTION PROTOTYPES AND UNITS FOR NAVY TESTING AND INITIAL DEPLOYMENT ARE OFFERED.

DESIGNERS & PLANNERS INC
2011 CRYSTAL DR - STE 500
ARLINGTON, VA 22202
CONTRACT NUMBER:
PIN YU CHANG
TITLE:
AIRCRAFT SUPPORT EQUIPMENT SHOCK RESPONSE
TOPIC# 210 OFFICE: NAEC/NAVAIR

SUBMITTED BY

CURRENT SHIPBOARD AIRCRAFT SUPPORT EQUIPMENT HAS INADEQUATE CAPABILITY TO RESIST EXPECTED SHOCK LEVELS IN HEAVY WEATHER AND COMBAT OPERATIONS. CAREFUL REVIEW OF THE STATE-OF-THE-ART INDICATES THAT MANY CURRENTLY USED PROCEDURES FOR SHOCK RESPONSE PREDICTION OF SHIPBOARD EQUIPMENT AND FOR SHIP GIRDER RESPONSE TO SHOCK LOADS ARE INADEQUATE BECAUSE OF THE MANY ASSUMPTIONS AND THE OVERSIMPLIFIED MODELS WHICH ARE USED. THE ANALYTICAL PROCEDURE PROPOSED HEREIN WILL USE THE NONLINEAR TIME-DOMAIN, 3-DIMENSIONAL ROSAS3 PROGRAM, AND GRILLAGE METHODS, TO PROVIDE ACCURATE PREDICTION OF THE SHOCK LOADS AND SHOCK RESPONSE. THIS PROPOSAL IS INNOVATIVE IN THAT IT WILL APPLY A NEW COMPUTER PROGRAM, ROSAS3, WHICH WILL ENABLE USE OF ADVANCED ANALYTICAL PROCEDURES. NOTE THAT THE GRILLAGE METHOD DOES NOT REDUCE THE DEGREES OF FREEDOM OF THE STRUCTURE, BUT SIMPLIFIES THE PROCESSES OF COMPUTATION BY MATHEMATICAL UNCOUPLING.

DIGITAL SIGNALS & SYSTEMS SPECIALISTS
11985 BROOKSTON DR
SPRINGDALE, OH 45240
CONTRACT NUMBER:
DR P A RAMAMOORTHY
TITLE:
BEAMFORMING FOR CHANGING HYDROPHONE GEOMETRY
TOPIC# 57 OFFICE: NAVSEA

CURRENT BEAMFORMERS OF INTEREST ASSUME A KNOWN AND FIXED HYDROPHONE GEOMETRY. THIS IS NOT ALWAYS THE CASE. AN IMPORTANT CASE OF INTEREST IS WHEN THE HYDROPHONE POSITIONS CHANGE WITH TIME. IN THIS CASE, THE PERFORMANCE OF BEAMFORMER DESIGNED FOR FIXED HYDROPHONE GEOMETRY WILL BE SIGNIFICANTLY DEGRADED. ON THE OTHER HAND, MODIFYING A BEAMFORMER TO RESPOND TO HYDROPHONE TIME TRAJECTORIES WILL REQUIRE CHANGES IN THE FUNDAMENTAL SHIPBOARD SIGNAL PROCESSING ARCHITECTURE, WHICH IS COSTLY AND INCONVENIENT. THIS PROPOSAL PRESENTS THE POSSIBILITY OF DEVELOPING A STAND-ALONE DEVICE WHICH WOULD SUPPLY INCREMENTAL DELAYS IN RESPONSE TO ARRAY GEOMETRY CHANGES SO THAT THE HYDROPHONE OUTPUTS WHICH GO TO THE CENTRAL BEAMFORMER WILL "APPEAR" TO BE COMING FROM UNDISTORTED GEOMETRY. THUS, THIS DEVICE WILL EFFECTIVELY UPGRADE EXISTING CONVENTIONAL BEAMFORMERS TO HANDLE CHANGING HYDROPHONES GEOMETRY WITHOUT HAVING TO CHANGE THE BEAMFORMER ARCHITECTURE. TWO APPROACHES ARE PROPOSED - THE FORMER FOR SITUATIONS WHERE TRAJECT-

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ORIES ARE KNOWN, AND THE LATTER FOR UNKNOWN HYDROPHONE POSITIONS WITH KNOWN NOMINAL (MEAN) POSITIONS.

DISPLAYTECH INC
2200 CENTRAL AVE - STE C
BOULDER, CO 80301
CONTRACT NUMBER:
MARK HANDSCHY
TITLE:
HIGH-PERFORMANCE SPATIAL LIGHT MODULATORS USING FERROE LIQUID CRYSTALS
TOPIC# 144 OFFICE: NSWC

THE PROPOSED WORK AIMS TO DEVELOP NOVEL, HIGH PERFORMANCE SPATIAL LIGHT MODULATORS (SLM) MADE FROM ARRAYS OF FERROELECTRIC LIQUID CRYSTAL (FLC) LIGHT VALVES. THE FLC TECHNOLOGY ALLOWS SIMPLE, ECONOMICAL FABRICATION OF SLMs WITH A LARGE NUMBER OF ELEMENTS THAT CAN BE EASILY ADDRESSED EITHER ELECTRONICALLY OR OPTICALLY. PERFORMANCE FEATURES INCLUDE SUBMICROSECOND WRITE TIMES, HIGH OPTICAL THROUGHPUT, HIGH CONTRAST, EITHER LOW-VOLTAGE, LOW-POWER ELECTRONIC OR OPTICAL ADDRESSING. PHASE I WILL DEVELOP A HIGH-RESOLUTION 128 X 128 "PROOF-OF-CONCEPT" SLM. DURING PHASE II, HIGHER SPEED SLMs WITH A LARGER NUMBER OF ELEMENTS WILL BE DEVELOPED; ALSO AT THIS TIME, OPTICAL ADDRESSING SCHEMES WILL BE DEVELOPED.

DISPLAYTECH INC
2200 CENTRAL AVE - STE C
BOULDER, CO 80301
CONTRACT NUMBER: N00163-88-C-0023
MARK HNDSCHY
TITLE:
FAST FIBER OPTIC SWITCH USING FERROELECTRIC LIQUID CRY
TOPIC# 250 OFFICE: NAC/NAVAIR

THE PROPOSED PROJECT AIMS TO DEVELOP A 1 X 2 ELECTRO-OPTIC SWITCH FOR USE WITH MULTIMODE OPTICAL FIBERS. BY EMPLOYING LIGHT VALVES HAVING FERROELECTRIC LIQUID CRYSTALS AS THE ELECTRO-OPTIC MEDIUM, THE DEVICES TO BE DEVELOPED WOULD EXHIBIT SWITCHING TIMES AT OR BELOW 1

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MICROSECOND. THE DEVICES WOULD BE SMALL IN SIZE, CONSUME LITTLE ELECTRICAL POWER AND WOULD COMPLETELY SWITCH UNPOLARIZED LIGHT WHILE MAINTAINING LOW INSERTION LOSS AND LOW CROSSTALK. THE DEVICES COULD BE FABRICATED WITHER AS DISCRETE SWITCHES OR AS LINEAR OR RECTANGULAR ARRAYS OF INDIVIDUALLY CONTROLLABLE SWITCHES. THE SWITCHING WILL BE ACCOMPLISHED BY DIVIDING THE LIGHT FROM THE INPUT FIBER INTO ORTHOGONAL LINEAR POLARIZATIONS, EXCHANGING POLARIZATION STATES WITH THE LIQUID CRYSTAL LAYER TO AFFECT THE SWITCHING AND RECOMBINING ALL THE LIGHT AT THE SELECTED OUTPUT FIBER.

DWA COMPOSITE SPECIALTIES INC
21119 SUPERIOR ST
CHATSWORTH, CA 91311
CONTRACT NUMBER: N00164-87-C-0263
DR WILLIAM C HARRIGAN JR
TITLE:
MATRIX ALLOY DEVELOPMENT FOR GRAPHITE/METAL MATRIX COM
TOPIC# 180 OFFICE: NWSC/SSPO

THE USE OF GRAPHITE/METAL COMPOSITES FOR SPACE STRUCTURE APPLICATIONS REQUIRING ZERO THERMAL EXPANSION CHARACTERISTICS HAS BEEN HAMPERED BY THE PROBLEM OF HYSTERESIS CAUSED BY MATRIX YIELDING. THIS HYSTERESIS HAS BEEN ELIMINATED IN LABORATORY SAMPLES BY HEAT TREATING THE COMPOSITE TO OBTAIN A MATRIX YIELD STRENGTH IN EXCESS OF 40 ksi OR THROUGH THE USE OF THERMAL CYCLING OF THE COMPOSITE MATERIAL. THESE THERMAL TREATMENTS, ALTHOUGH PRACTICAL FOR LABORATORY SAMPLES, BECOME IMPRACTICAL WHEN LARGE (15 METER LONG TUBES) STRUCTURES ARE MANUFACTURED. THE OBJECTIVE OF THIS PHASE I PROGRAM IS TO DEMONSTRATE THE FEASIBILITY OF PRODUCING A HYBRID GRAPHITE/METAL COMPOSITE MATERIAL WHICH, WITHOUT THE NEED FOR THERMAL TREATMENTS, WOULD EXHIBIT LITTLE OR NO THERMAL HYSTERESIS.

DWA COMPOSITE SPECIALTIES INC
21119 SUPERIOR ST
CHATSWORTH, CA 91311
CONTRACT NUMBER: N00164-87-C-0261
JOSEPH F DOLOWY JR
TITLE:
THE PHYSICS OF MMC'S: MICROSTRUCTURAL EFFECTS
TOPIC# 180 OFFICE: NWSC/SSPO

SUBMITTED BY

THIS PHASE I PROGRAM WILL CHARACTERIZE AND DEMONSTRATE THE EFFECTS ON STATIC MECHANICAL PROPERTIES AND COMPOSITE TOUGHNESS OF FINE GRAIN SIZE MICROSTRUCTURE OF GRANULAR STRUCTURE COMPOSITES WITH ISOTROPIC CHARACTERISTICS. PRESENT CERMETS AND DISCONTINUOUSLY REINFORCED METAL-MATRIX COMPOSITE MATERIALS ARE BING PRODUCED VIA A PROCESS THAT INCLUDES A MECHANICAL MIXING STEP TO COMBINE AND RANDOMLY ORIENT THE CONSTITUENTS. THIS PROJECT WILL UTILIZE BASIC COMPOSITE PROCESSING TECHNOLOGY WITH A FINE AND A COARSE FORM OF CERAMIC REQUIREMENT, A FINEGRAIN AND COARSEGRAIN MATRIX, AND OPEN-PORE CERAMIC AND METAL MAT MATERIALS. SUBSEQUENT PROCESSING STEPS WOULD BE SIMILAR TO PRESENT COMPOSITE-FABRICATION TECHNIQUES, BUT EMPHASIZING UNIFORM, FINEGRAINED, OR COARSEGRAIN RESULTANT MICROSTRUCTURE. INITIAL MAT REINFORCEMENT CHARACTERISTICS CAN BE USED TO CREATE SKELETAL FORMS (A DISCONTINUOUS FILAMENTARY PHASE) AND TO ENABLE INCORPORATION OF DISSIMILAR-PHASE OR MATRIX MATERIAL, INTO THE COMPOSITE. PLATES OF COARSE AND FINE REINFORCEMENTS AND MATRICES WILL BE FABRICATED FOR SEM EVALUATION AND BASIC MECHANICAL TESTS. THIS PROGRAM WILL BOUND MICROSTRUCTURAL GRAIN SIZE EFFECTS AND OFFER VERSATILITY BEYOND PRESENT COMPOSITE PROCESSING SYSTEMS. SINCE A WIDE VARIETY OF CERAMIC, GRAPHITIC, METAL AND/OR ORGANIC MAT AND FOAM IS AVAILABLE, BY APPROPRIATE PROCESSING, THE MATERIALS' UNIQUE CHARACTERISTICS CAN BE DESIGNED INTO THE MMC SYSTEM.

DYNAMICS TECHNOLOGY INC
21311 HAWTHORNE BLVD - STE 300
TORRANCE, CA 90503
CONTRACT NUMBER:
SHIN H CHEN
TITLE:
VIDEOGRAPHIC PARTICLE TRACKING
TOPIC# 200 OFFICE: NUSC

DYNAMICS TECHNOLOGY (DIT) PROPOSES TO APPLY A DEMONSTRATED VIDEO-BASED MOTION ANALYSIS SYSTEM TO THE PROBLEM OF TRACKING SMALL PARTICLES (~100um) IN A HIGH SPEED LAMINAR BOUNDARY LAYER IN WATER. THE PRINCIPAL ISSUES IN THIS REGARD ARE (1) TO ACHIEVE ADEQUATE ILLUMINATION AND RESOLUTION TO ACCURATELY TRACK HIGH SPEED PARTICLES WHICH ARE CLOSE TO A BODY'S SURFACE, AND (2) TO ATTAIN TRACKING OVER AN EXTENDED LENGTH OF THE BODY. IN PHASE I DTI WILL PERFORM AN

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ANALYTICAL DESIGN ASSESSMENT AND A LABORATORY DEMONSTRATION OF A SUB-SCALE 2-DIMENSIONAL PARTICLE TRACKING SYSTEM IN A WATER JET FACILITY IN THE DTI LABORATORY. A LASER ILLUMINATION METHOD WILL BE EMPLOYED AND ALTERNATIVE IMAGE RECORDING AND DATA ANALYSIS TECHNIQUES WILL BE EVALUATED. THE PHASE I RESEARCH WILL ESTABLISH THE CONCEPT FEASIBILITY AND IDENTIFY THE DEVELOPMENT REQUIREMENTS FOR PHASE II, WHERE THE PROPOSED SYSTEM CAN BE EXTENDED TO 3-DIMENSIONAL PARTICLE TRACKING.

ECLECTECH
PO BOX 177
OAK RIDGE, TN 37831
CONTRACT NUMBER:
JAMES F KIRKPATRICK
TITLE:
VOICE INPUT IN ICON DRIVEN PROGRAMMING ENVIRONMENT
TOPIC# 165 OFFICE: JCMPO

A TEST PROGRAM IS PROPOSED TO DEMONSTRATE THE USE OF VOICE INPUT IN AN INTUITIVE ENVIRONMENT FOR PROGRAMMING. THE PROGRAMMING ENVIRONMENTS, WHICH IS UNDER DEVELOPMENT BY ECLECTECH, CONSISTS OF ASSEMBLING A FLOW CHART FROM A MENU OF ICONS ON A GRAPHICS WORK STATION. THE INTERACTIVE PROCESS RESULTS IN THE CONCURRENT CONSTRUCTION OF A FLOW CHART AND A USER SPECIFIED HIGH LEVEL LANGUAGE (HLL) SOURCE TEXT FILE. THE METHOD FORCES APPROPRIATE USER RESPONSES DURING FLOW CHART CONSTRUCTION EXCEPT WHEN UNRESTRICTED TEXT INPUT IS CONVENIENT FOR IDENTIFICATION OF CONSTANTS, DATA STRUCTURES, PROGRAM SUBSTRUCTURES, AND OTHER LABELS. WE PROPOSE TO USE VOICE AS THE PRIMARY TEXT ENTRY MECHANISM. THE RESULT OF THE PHASE I EFFORT WOULD BE A PROTOTYPE FOR DEMONSTRATION OF THE CONCEPT.

ECO
20 ASSEMBLY SQUARE DR
SOMERVILLE, MA 02145
CONTRACT NUMBER:
DR FRASER WALSH
TITLE:
AN ENERGY-DENSE HIGH-RATE POWER SUPPLY FOR ROBOTS
TOPIC# 145 OFFICE: NSWC

SUBMITTED BY

THE PROPOSED PROGRAM RELATES TO THE IDENTIFICATION OF A MIXED SOLVENT ELECTROLYTE CAPABLE OF EXTENDING THE POWER DENSITY, CYCLE LIFE AND USEFUL TEMPERATURE RANGE OF A LITHIUM SECONDARY BATTERY. CELLS WITH ELECTROLYTES CONTAINING A MIXTURE OF A CYCLIC ETHER AND AN ALKYL UREA WILL BE TESTED. THE MIXTURE HAS BEEN CHOSEN FOR EVALUATION BECAUSE INITIAL NMR DATA SHOWED THESE TWO SOLVENT TYPES TO HAVE CONSIDERABLE ELECTRON CLOUD OVER-LAP WHEN MIXED IN THE PROPER PROPORTIONS. SUCH OVER-LAP PROVIDES FOR HIGHER CHEMICAL STABILITY AND SOLUTE SOLVATION POWER. SUCCESSFUL COMPLETION OF THE PROGRAM WILL RESULT IN THE IDENTIFICATION OF A MIXED SOLVENT ELECTROLYTE WHICH PROVIDE AT LEAST 2 mA/cm 2 PERFORMANCE OVER A BROAD TEMPERATURE RANGE (-40 DEG TO +71 DEG C) OF A LITHIUM SECONDARY CELL) THE MIXTURE WILL ALSO SUPPORT EXTENDED CELL CYCLING ON STORAGE. THE PROGRAM APPROACH IS TO CARRY OUT CELL CYCLE TESTS OVER A BROAD TEMPERATURE RANGE. ELECTROLYTE DEGRADATION WILL BE FOLLOWED BY GC AND NMR; ANODE SURFACE CHARACTERISTICS WILL BE DETERMINED BY A TECHNIQUE BASED ON THE MEASUREMENT OF GAL VANOSTATIC TRANSIENTS. THE OPTIMIZED ELECTROLYTE MIXTURE WILL BE TESTED IN MULTIELECTRODE SEALED CELLS.

ECODYNAMICS RESEARCH ASSOCS INC
PO BOX 8172
ALBUQUERQUE, NM 87198
CONTRACT NUMBER:
DR PATRICK J ROACHE
TITLE:
THREE-DIMENSIONAL TRANSIENT FLOW PREDICTION
TOPIC# 199 OFFICE: NUSC

THIS PROPOSAL IS FOR A DESIGN STUDY FOR THE DEVELOPMENT OF A COMPUTER CODE FOR THREE DIMENSIONAL TRANSIENT FLOW PREDICTION. THE COMPUTER CODE WILL BE CAPABLE OF ACCURATELY PREDICTING INCOMPRESSIBLE TRANSIENT TURBULENT FLOW FIELDS USING THE FINITE VOLUME TECHNIQUE. THE CODE WILL BE APPLICABLE TO THREE DIMENSIONAL INTERNAL AND EXTERNAL FLOW PROBLEMS AND WILL BE IN THE FORM OF GENERALIZED CURVILINEAR COORDINATES TO INCLUDE CARTESIAN, CYLINDRICAL, AND SPERICAL SPACE. THE ALGORITHM WILL BE CAPABLE OF PERFORMING BOTH FULLY ELLIPTIC AND ELLIPTIC PARABOLIC ANALYSES. THE TURBULENCE MODEL WILL AT LEAST INCLUDE THE TWO EQUATION K-E METHOD. THE CODE WILL BE COMPATIBLE WITH THE VAX 11/780 COMPUTER, WILL BE FULLY DOCUMENTED, AND BENCHMARKED

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AGAINST EXPERIMENTS. THE CODE WILL UTILIZE A PREVIOUSLY DEVELOPED USER-FRIENDLY NAMELIST TECHNIQUE FOR PROBLEM DEFINITION AND OPTION SLECTION. THE ALGORITHMS WILL EMPLOY ACCURATE RUNGE-KUTTA TIME INTEGRATION, WILL USE EFFICIENT MULTIGRID METHODS FOR ELLIPTIC EQUATIONS, WILL INCLUDE AUTOMATIC ERROR ESTIMATION, AND WILL INCLUDE THE OPTION FOR SOLUTION ADAPTIVE GRID GENERATION.

EIC LABS INC
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER:
DR MICHAEL M CARRABBA
TITLE:
REMOTE FIBER OPTIC SENSOR FOR GASEOUS AND LIQUID ENVIR
ON SURFACE ENHANCED RAMAN SPECTROSCOPY (SERS)
TOPIC# 263 OFFICE: ONR

THERE IS A UNIVERSAL NEED WITHIN THE DEFENSE-RELATED OPERATIONS FOR CHEMICAL SENSING. IN MOST CASES, THE FAVORABLE CONFIGURATION OF A SENSOR WOULD BE ONE IN WHICH THE DETECTOR (I.E., PROBE) WOULD OPERATE IN SITU AND PRODUCE INFORMATION ON CHEMICAL COMPOSITION IN REAL TIME WITH A HIGH LEVEL OF SENSITIVITY (PPB OR LESS). IT IS THE GOAL OF THE PROPOSED WORK TO DEVELOP A "UNIVERSAL" REMOTE SENSOR FOR ORGANIC AND INORGANIC COMPOUNDS IN BOTH THE GASEOUS AND LIQUID ENVIRONMENT. THE PROPOSED SENSOR WOULD BE BASED ON SURFACE ENHANCED RAMAN SPECTROSCOPY (SERS). THE SERS SIGNAL, WHICH CORRESPONDS TO VIBRATIONAL SPECTRA OF A MOLECULE ADSORBED ONTO A ROUGHENED METAL SUBSTRATE, IS OBTAINED FROM THE RAMAN SCATTERING OFF THE SUBSTRATE USING A VISIBLE LASER SOURCE. REMOTE SENSING WILL BE ACHIEVED USING OPTICAL FIBERS FOR EXCITING THE METAL SUBSTRATE, CONTAINED IN A PROBE HEAD, AND FOR RETURNING THE SCATTERED LIGHT TO THE DETECTOR. THE GOAL OF PHASE I IS THE DEMONSTRATION THAT SERS CAN BE USED AS A GAS PHASE SENSOR FOR ORGANIC GASES OR MIXTURES OF ORGANIC GASES. THE GOAL OF THE PHASE II PROGRAM IS TO DEVELOP A SERS FIBER OPTIC BASED "UNIVERSAL" SENSOR FOR ORGANIC AND INORGANICS IN BOTH THE GASEOUS AND LIQUID ENVIRONMENTS.

EIC LABS INC
111 DOWNEY ST
NORWOOD, MA 02062
CONTRACT NUMBER:
DR K M ABRAHAM
TITLE:
CHARACTERIZATION STUDIES OF THE LITHIUM/POLY-CARBON MO
BATTERY
TOPIC# 129 OFFICE: NSWC

SUBMITTED BY

A PROGRAM TO STUDY THE SAFETY RELATED CHEMISTRY OF THE Li/(CF)X BATTERY IS PROPOSED. COMMERCIAL C-SIZE CELLS WILL BE USED AS THE TEST VEHICLES FOR THIS INVESTIGATION. IN LAYING THE FOUNDATION FOR A COMPREHENSIVE ASSESSMENT OF THE SAFETY ASPECTS OF THE Li/(CF)X BATTERY, THE PHASE I EFFORT WILL EMPHASIZE: (i) ANALYSIS OF FRESH CELLS TO DETERMINE THE BASELINE CHEMISTRY OF THE SYSTEM; (ii) FORCED OVERDISCHARGE OF CELLS AT THE SERIES OF CURRENTS; (iii) CHARGING OF FRESH AND PARTIALLY DISCHARGED CELLS, AND (iv) SHORT-CIRCUIT BEHAVIOR OF THE CELLS. A MAJOR EMPHASIS WILL BE ON CHEMICAL ANALYSIS TO DETERMINE CHEMICAL CHANGES OCCURRING WITHIN THE CELL AS A RESULT OF THE ABUSE TREATMENTS.

ELECTRO IMPACT INC
2929 NE BLAKELY ST
SEATTLE, WA 98105
CONTRACT NUMBER:
DR PETER B ZIEVE
TITLE:
TRANSIENT FIELD MODELING AND MODEL VERIFICATION FOR AN ELECTROMAGNETIC LAUNCHER
TOPIC# 198 OFFICE: NUSC

THE PROPOSED UNDERSEA MAGNETIC LAUNCHER COULD PROVIDE BENEFIT TO THE NAVY. BUT THE MODERN TORPEDO AND THE AREA ADJACENT TO THE TORPEDO TUBES IS JAMMED WITH DIGITAL ELECTRONICS INCLUDING MICROPROCESSORS. IF THE SHOOTING OFF OF THE TORPEDO SHOULD CAUSE A MEMOR LOCATION TO CHANGE STATE THE MISSION OF THE TORPEDO COULD BE ABORTED, OR IN THE WORST CASE, THE SHIP ITSELF COULD BE PUT IN JEOPARDY. THE DESIGN OF THE LAUNCHER THEREFORE MUST BE SUCH THAT THE TRANSIENT INDUCED VOLTAGE IN ADJACENT ELECTRONICS DOES NOT EXCEED A FRACTION OF A VOLT, NOT LIKELY IF THE RATE OF CHANGE OF AXIAL FLUX DENSITY IS LESS THAN 2.5 TESLA/SEC. A UNIQUE MAGNETODYNAMIC MODEL FOR AXISYMMETRIC GEOMETRY HAS BEEN DEVELOPED BY ELECTROIMPACT, INC. AND IS CAPABLE OF ACCURATELY PREDICTING THE RESULTING FIELD STRENGTHS. THE OVERALL GEOMETRY CAN BE FLEXIBLY ARRANGED AND ALTERED SINCE THE MODEL EMPLOYS A GENERALIZED SOLUTION FOR THE MUTUAL COUPLING OF CONCENTRIC CURRENT LOOPS. THE MODEL WILL BE SUPPLIED WITH CONVENIENT MENU DRIVEN INTERFACE FOR PARAMETER AND GEOMETRY CHANGES, AND SUPPLIED FOR USE BY THE NAVY. MODEL VERIFICATION TESTING WILL BE PERFORMED WITH EQUIPMENT

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PRESENTLY IN HOUSE. AFTER VERIFICATION TESTING THE MODEL WILL BE RUN FOR A RANGE OF PARAMETERS SPECIFIED BY THE SPONSORS SO THAT THE FINAL REPORT SERVES AS A CONVENIENT LAUNCHER DESIGN REFERENCE.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 26263
DENVER, CO 80226
CONTRACT NUMBER:
RODNEY A PERALA
TITLE:
A PROPOSAL TO EVALUATE THE OBSERVABILITY OF ROTORCRAFT TROSTATIC CHARGING
TOPIC# 98 OFFICE: NAVAIR

TWO MECHANISMS ARE IDENTIFIED BY WHICH AN ELECTRICALLY CHARGED ROTORCRAFT MIGHT ACT AS A SOURCE OF ELECTROMAGNETIC RADIATION. THESE ARE NARROW BAND ELF RADIATION PRODUCED BY CURRENTS INDUCED BY ROTOR ROTATION AND BROADBAND ELECTROMAGNETIC RADIATION FROM P STATIC. IN ORDER TO DETERMINE WHETHER OR NOT RADIATION DUE TO THESE MECHANISMS IS DETECTIBLE A COMBINATION OF NUMERICAL MODELLING TECHNIQUES IS PROPOSED. THE GOAL OF THE ANALYSIS EFFORT IS TO PROVIDE ESTIMATES OF THE AMPLITUDES OF THE ELECTROMAGNETIC RADIATION DUE TO THESE TWO MECHANISMS AS A FUNCTION OF DISTANCE FROM THE ROTORCRAFT AND TO IDENTIFY THE BEST MEANS OF DETECTION OF THAT RADIATION.

ELECTRO MAGNETIC APPLICATIONS INC
PO BOX 8482
ALBUQUERQUE, NM 87198
CONTRACT NUMBER:
T H LEHMAN
TITLE:
THREE-DIMENSIONAL NON-LINEAR PHASED ARRAY CONCEPT FEAS
TOPIC# 33 OFFICE: SPAWAR

A NEW APPROACH TO PHASED ARRAY ANTENNA DESIGN IS PROPOSED, BASED ON UNPUBLISHED WORK AT EMA, WHICH PREDICTS THE POSSIBILITY OF PRODUCING GIGAWATTS OF EFFECTIVE RADIATED POWER. PRELIMINARY PREDICTIONS BASED ON THE NEW DESIGN CONCEPTS INDICATE AS MUCH AS 80 dB INCREASE

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IN POWER OVER CONVENTIONAL PHASED ARRAY DESIGNS MAY BE ACHIEVABLE. EMA'S CONCEPTS ALLOW ENERGY TO BE STORED ON THE ANTENNA THROUGH A LOW FREQUENCY SOURCE (AS COMPARED TO THE DESIRED MICROWAVE PROPAGATION FREQUENCY). THE SOURCE IS THEN DISCONNECTED (SWITCHED) TO ALLOW A HIGHLY DIRECTED, HIGH GAIN OUTPUT AT FREQUENCIES AS MUCH AS 100 TIMES THE SOURCE FREQUENCY. EMA WILL DEMONSTRATE THE FEASIBILITY OF THIS CONCEPT DURING THE PHASE I EFFORT.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
CONTRACT NUMBER:
WILLIAM S CHAN
TITLE:
MULTI-COLOR (HgTe)X(InSb)1-X ARRAY
TOPIC# 114 OFFICE: NAVAIR

EPITAXIAL GROWTH OF MULTILAYERS OF (HgTe)X(InSb)1-X ON SILICON-ON-SAPPHIRE (SOS) SUBSTRATES BY MOLECULAR BEAM EPITAXY (MBE) HAS BEEN PROPOSED. THE MBE TECHNIQUE CAN PRODUCE HIGH-QUALITY MULTIEPILAYERS OF (HgTe)X(InSb)1-X WITH DIFFERENT X VALUES, WHICH WILL GIVE RISE TO DIFFERENT CUTOFF WAVELENGTHS IN THE INFRARED SPECTRAL REGION. THUS, MULTICOLOR DETECTOR CAN BE MADE WITH THESE MULTIEPILAYER STRUCTURES ALONG WITH READOUT ELECTRONICS WHICH ARE ALSO FABRICATED ON THE SAME SOS SUBSTRATE. THE PROPOSED EFFORT IS PHASE I OF A THREE PHASE PROGRAM, WITH PHASE I TASKED TO DEFINE THE MBE GROWTH PROCESSES AND DESIGN THE EQUIPMENT MODIFICATIONS FOR FABRICATING THE (HgTe)X(InSb)1-X MULTIEPILAYERS AND THE MULTICOLOR DETECTOR ARRAYS.

ELECTRO-OPTEK CORP
3152 KASHIWA ST
TORRANCE, CA 90505
CONTRACT NUMBER:
WILLIAM S CHAN
TITLE:
MULTI-COLOR PbSSe ARRAY
TOPIC# 131 OFFICE: NSWC

SUBMITTED BY

EPITAXIAL GROWTH OF THIN LAYERS OF PbS(X)Se(1-X) ON BaF(2) SUBSTRATE BY MOLECULAR BEAM EPITAXY (MBE) HAS BEEN PROPOSED. THE MBE TECHNIQUE CAN PRODUCE HIGH-QUALITY MULTILAYERS OF PbS(X)Se(1-X) WITH DIFFERENT X VALUES, WHICH WILL GIVE RISE TO DIFFERENT CUTOFF WAVELENGTHS IN THE INFRARED SPECTRAL REGION. SCHOTTKY-BARRIER DETECTORS CAN THEN BE FABRICATED BY DEPOSITING AN APPROPRIATE METAL ON TOP OF THE PbS(X)Se(1-X) MULTILAYERS AND THE SCHOTTKY-BARRIER DETECTOR ARRAYS.

ELECTRO-RADIATION INC
225 RTE 46 - STE 7
TOTOWA, NJ 07512
CONTRACT NUMBER:
MURRAY W ROSEN
TITLE:
MULTIPOINT TARGET RADIO FREQUENCY AUGMENTATION
TOPIC# 216 OFFICE: PMTC/NAVAIR

THE PROGRAM EXAMINES THE MAJOR DESIGN REQUIREMENTS AND DESIGN DECISIONS ASSOCIATED WITH THE DEVELOPMENT OF AN ACTIVE DUAL SOURCE MULTIPOINT TARGET RF AUGMENTOR FOR RADAR SIGNATURE ENHANCEMENT OF SMALL MISSILE-TYPE TEST TARGETS. THE EFFORT CONDUCTS THE TARGET AND INSTALLATION RESEARCH; DEFINES THE OPERATIONAL OBJECTIVES; DEFINES LARGE TARGET RF SIGNATURES; SELECTS AN AUGMENTATION SYSTEM DESIGN APPROACH; DETERMINES THE PERFORMANCE AND TECHNICAL FEASIBILITY; AND DEFINES A PROTORYPE DESIGN, SPECIFICATION, AND PLAN FOR FUTURE DEVELOPMENT. THE PROJECT UTILIZES A DUAL SOURCE ACTIVE RF AUGMENTOR DESIGN WITH SPACE TRANSMIT ANTENNAS. THE SYSTEM DESIGN PROVIDES THE CAPABILITY TO MODULATE THE RADAR RESPONSE AND ENHANCE ITS CHARACTERISTICS USING RF AMPLIFICATION (TARGET GAIN), RANGE NOISE, DOPPLER MODULATION, AMPLITUDE MODULATION, AND PHASE AND AMPLITUDE PHASE-FRONT DISTORTION TECHNIQUES.

ELECTRONICS IMAGE SYSTEMS INC
600 BELLBROOK AVE
XENIA, OH 45385
CONTRACT NUMBER:
JOE A MAYS
TITLE:
ELECTRICAL FAULT CURRENT LIMITER
TOPIC# 15 OFFICE: ONT/DTRC

SUBMITTED BY

A NEED EXISTS FOR A LOW COST ELECTRICAL FAULT CURRENT LIMITER EXHIBITING VERY LOW VOLTAGE DROP UNDER NORMAL CONDITIONS WHICH WILL REACT IN NEAR INSTANTANEOUS FASHION TO AN OVERCURRENT CONDITION AND BE SELF HEALING; I.E. REVERT TO THE NORMAL STATE AUTOMATICALLY WHEN THE FAULT IS REMOVED. A PROGRAM IS PROPOSED TO: (1) DEVELOP CIRCUIT DESIGNS UTILIZING POWER FET DEVICES AS THE CURRENT HANDLING SWITCH FOR BOTH DC AND AC POWER SYSTEMS, (2) DEVELOP SUITABLE GATE BIAS AND CURRENT SAMPLING CIRCUITRY, (3) DEVELOP MODULAR CIRCUIT CONFIGURATIONS TO EXTEND THE CURRENT HANDLING CAPABILITY TO INCLUDE 5000 AMP POWER DISTRIBUTION SYSTEM, (4) EXPLORE MEANS OF PROVIDING "SOFT START" CAPABILITY FOR LOADS EXHIBITING HIGH CURRENTS ON "TURN-ON." THIS WILL ENABLE DISTRIBUTION SYSTEMS TO OPERATE MUCH CLOSER TO MAXIMUM CAPACITY WITHOUT RISK OF LOSING POWER TO VITAL LOADS, (5) FABRICATE PROTOTYPE DEVICES AND CONDUCT TESTS TO DETERMINE FAULT DETECTION AND RECOVERY TIMES, AND (6) PREDICT THE PRODUCTION COST OF TYPICAL DEVICES. THE RESULTS WILL BE ANALYZED TO DETERMINE THE FEASIBILITY OF CARRYING THE PROGRAM INTO A PRODUCT DEVELOPMENT PHASE. THE RESULTS OF THIS ANALYSIS WILL BE DOCUMENTED IN A FINAL REPORT.

ENFITEK INC
549 BRYCE AVE
LOS ALAMOS, NM 87544
CONTRACT NUMBER: N60530-88-C-0028
ALBERT ENGELHARDT
TITLE:
A SIMPLE SAFETY ARMING SWITCH
TOPIC# 170 OFFICE: NWC/NAVAIR

A SIMPLE SAFETY ARMING SWITCH FOR GUIDED MISSILES CAN BE BUILT AROUND AN ACCELEROMETER AND INTEGRATING CIRCUIT. IN GENERAL, DURING THE LAUNCH BOOST PHASE, THE ACCELERATION OF A MISSILE INCREASES TO A MAXIMUM JUST BEFORE BURNOUT. CHARACTERISTIC ACCELERATION PROFILES FOR A PARTICULAR MISSILE ARE DEPENDENT UPON FUEL TAILORING AND MISSION REQUIREMENTS; I.E. AIR-TO-AIR MISSION, GROUND-TO-AIR MISSION, ETC. AN ACCELERATION ACTIVATED SAFETY ARMING SWITCH COULD DETERMINE THE MISSILE'S ACCELERATION AND THE DISTANCE TRAVELED. SUCH A SAFETY ARMING SWITCH COULD COMPARE THE MEASURED ACCELERATION PROFILE TO THAT EXPECTED OF THE MISSILE AND PROVIDE A FINAL SAFETY CHECK BEFORE ENERGIZING THE MISSILE'S FIRING CIRCUIT. THIS PROPOSAL ADDRESSES THE

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DESIGN AND DEVELOPMENT OF AN ACCELERATION ACTIVATED SAFETY ARMING SWITCH FOR A MISSILE. THE PROPOSED SWITCH WILL FIRST BE DEVELOPED IN ANALOG FORM TO FACILITATE DESIGN VERIFICATION. ONCE THE BASIC DESIGN HAS BEEN DETERMINED, THE SWITCH WILL BE REDESIGNED AS A SOLID STATE DEVICE.

EOS INC
3817 ACADEMY PARKWAY SOUTH NE
ALBUQUERQUE, NM 87109
CONTRACT NUMBER:
DR MALCOLM J MacFARLANE
TITLE:
LOW COST OPTICAL POINTER TRACKER
TOPIC# 36 OFFICE: SPAWAR

AN "OPTICAL VERNIER" IS PROPOSED WHICH WILL ALLOW CLOSED LOOP, HIGH PRECISION POINTING AND TRACKING OF A RECEIVER FOR LINE-OF-SIGHT, SHIP-TO-SHIP OPTICAL COMMUNICATIONS. USING REFLECTING CORNER CUBES AS A FEEDBACK DEVICE, THE VERNIER ALLOWS VERY HIGH PRECISION TRACKING USING INEXPENSIVE GIMBALS. TRACKING IS DONE BY DEFLECTING THE OUTPUT BEAM RATHER THAN GIMBALLING THE ENTIRE TRANSMITTER.

ESSEX CORP
3211 JEFFERSON ST
SAN DIEGO, CA 92110
CONTRACT NUMBER:
ROGER P McTIGHE
TITLE:
DEVELOPMENT OF A COMBATANT/SQUADRON LEVEL AUTOMATION S
MANAGEMENT OF READINESS OPERATIONS AND MAINTENANCE
TOPIC# 143 OFFICE: NSWC

THE PRESENT SYSTEM OF KEEPING TRACK OF THE MYRIAD OF READINESS, OPERATIONS AND MAINTENANCE IS EXTREMELY LABOR INTENSIVE USING PENCIL, PAPER, GREASE BOARDS AND MANUALLY GENERATED REPORTS TO HIGHER AUTHORITY. THIS RESEARCH EFFORT WILL EXAMINE THE FEASIBILITY OF AUTOMATING INFORMATION NEEDS AT THE COMBATANT/SQUADRON LEVEL AND THE REPORTING REQUIREMENT OF HIGHER AUTHORITY. THIS RESEARCH EFFORT WILL

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BE ACCOMPLISHED BY INTERVIEWING OPERATIONS MAINTENANCE, ADMINISTRATIVE, EXECUTIVE AND COMMANDING OFFICERS OF H S SQUADRONS AT N.A.S. NORTH ISLAND, SAN DIEGO, CALIFORNIA. ONCE THE DATA IS GATHERED, PRIORITIES WILL BE SET AND A DETERMINATION MADE IF AUTOMATION IS FEASIBLE AND COST EFFECTIVE.

EUREKA LABS INC
3401 LA GRANDE BLVD
SACRAMENTO, CA 95832
CONTRACT NUMBER:
DR STEVEN K LEUNG
TITLE:
AUTOMATION OF SHIPBOARD BOMB ASSEMBLY OPERATIONS
TOPIC# 211 OFFICE: NAEC/NAVAIR

AN AUTOMATION SYSTEM UTILIZING TECHNOLOGIES OF ROBOT MANIPULATOR AND AUTOMATED GUIDED VEHICLE (AGV) IS PROPOSED FOR THE SHIPBOARD BOMB ASSEMBLY OPERATION. THE AGV SYSTEM IS AN INDUSTRIAL PROVEN TRANSPORTATION SYSTEM FOR MATERIAL HANDLING IN A RELATIVELY UNCHANGED ENVIRONMENT WITH MINIMAL HUMAN SUPERVISION REQUIRED. THE FEASIBILITY OF UTILIZING THE AGV SYSTEM FOR BOMB TRANSPORTATION AND WEAPON HANDLING IN THE LOWER DECKS OF AN AIRCRAFT CARRIER BASED ENVIRONMENT WILL BE STUDIES. THE ROBOT MANIPULATOR SYSTEM WHICH WILL CONSIST OF TWO OR MORE SPATIAL POSITIONING MANIPULATORS IS PROPOSED FOR THE BOMB ASSEMBLY OPERATION IN THE ASSEMBLY AREA. EACH MANIPULATOR IN THE SYSTEM WILL BE CONFIGURED GENERALLY IN THE SIMPLEST FORM, AND WILL HANDLE A PARTICULAR ASSEMBLY PROCESS. EACH WILL WORK IN A COORDINATED FASHION WITH THE OTHERS AND THE AGV SYSTEM. SENSOR SYSTEMS FOR OBSTACLE AVOIDANCE, LOCAL AND GLOBAL NAVIGATION, AND POSITION/PART DETECTION WILL BE INCORPORATED IN THIS STUDY. THE USE OF HIGH SPEED MICRO-COMPUTER ARCHITECTURE WITH MULTIPROCESSING CAPABILITIES YIELDING A COST-EFFECTIVE, HIGH PRODUCTIVITY BACKGROUND, CONTROL/MONITOR SYSTEM WILL ALSO BE INVESTIGATED.

EXAC CORP
1370 DELL AVE
CAMPBELL, CA 95008
CONTRACT NUMBER:
ALAN YOUNG
TITLE:
MASS FLOWMETER TECHNOLOGY
TOPIC# 79 OFFICE: NAVSEA

SUBMITTED BY

THE OBJECTIVE OF THE PROPOSED PHASE I EFFORT IS TO DETERMINE THE FEASIBILITY OF USING RECENTLY DEVELOPED, COMMERCIALLY AVAILABLE MASS FLOW MEASUREMENT TECHNOLOGY (BASED ON THE CORIOLIS PRINCIPLE) FOR OPEN SEA RE-FUELING OPERATIONS. MASS FLOW RATE MEASUREMENT OF FUELS BASED UPON THE CORIOLIS PRINCIPLE ARE SUPERIOR TO TRADITIONAL VOLUMETRIC TECHNOLOGIES BECAUSE A DIRECT NON-INVASIVE MEASUREMENT OF MASS FLOW IS OBTAINED INDEPENDENT OF THE FUEL'S PHYSICAL OR CHEMICAL PROPERTIES. THE PROPOSED PHASE I EFFORT WILL EVALUATE THE SUITABILITY OF A COMMERCIALLY AVAILABLE CORIOLIS MASS FLOWMETER FOR OPEN SEA RE-FUELING FROM THE STANDPOINT OF OPERATIONAL PERFORMANCE, ENVIRONMENTAL RUGGEDNESS AND EXPLOSION PROTECTION.

EXFLUOR RESEARCHCORP
PO BOX 7807
AUSTIN, TX 78713
CONTRACT NUMBER:
DR TIMOTHY J JUHLKE
TITLE:
IMPROVED METHOD FOR THE SYNTHESIS OF DIFUNCTIONAL FLUO
TOPIC# 156 OFFICE: NSWC

SEVERAL PERFLUORODICARBOXYLIC ACIDS WILL BE PRODUCED BY DIRECT FLUORINATION AND REDUCED TO THE CORRESPONDING DIFUNCTIONAL FLUOROALCOHOLS. WITH DIRECT FLUORINATION ONE CAN PRODUCE FLUOROALCOHOLS WHICH CONTAIN LONG CHAIN OR BRANCHED FLUOROCARBON SECTIONS EASIER THAN BY CONVENTIONAL METHODS. IN ADDITION SOME SMALL CHAIN PERFLUOROPOLYETHER DIACIDS WILL BE MADE AND CONVERTED TO THE FLUOROALCOHOLS. THE ABILITY TO VARY THE LENGTH AND COMPOSITION OF THE FLUORINATED PORTION OF THE DIOL SHOULD ALLOW SOME TAILORING OF POLYMER PROPERTIES WHEN THESE DIOLS ARE USED AS COMPONENTS OF POLYMERS.

EXPERT SYSTEMS ENGINEERS
PO BOX 80337 - 83 WILSON PKWY
FORT WORTH, TX 76180
CONTRACT NUMBER: N00164-87-C-0195
PAUL T ECKERT
TITLE:
DEVELOPMENT OF A PASSIVE THERMAL ATTENUATOR (PTA) WITH THERMAL RESISTANCE CHARACTERISTICS
TOPIC# 181 OFFICE: NWSC/SSPO

SUBMITTED BY

CERTAIN SUBSTANCES EXHIBIT NONLINEAR RESPONSES TO THERMAL GRADIENTS APPLIED ACROSS THEM. IN PARTICULAR, CERTAIN COMPOUNDS OF THE IIIa/Va GROUPS EXHIBIT UNIDIRECTIONAL RESPONSES TO THERMAL FLUX, WHERE THE CTE DIFFERS BETWEEN X- AND Y-, OR X- AND Z- AXES. WE PROPOSE TO USE A COMPOSITE MATRIX OF TWO DIFFERENT MATERIALS SANDWICHED INTO A SMALL CROSS-SECTIONAL AREA, TO ACT AGAINST THE NORMAL THERMAL GRADIENT. THE MATERIALS DIFFER SUBSTANTIALLY IN THEIR CTEs, ONE HAVING NEAR-ZERO OR NEGATIVE CTE, THE OTHER EXHIBITING NORMAL, POSITIVE, BUT LINEAR CTE. BY CAREFUL GEOMETRIC INTERDIGITIZATION BETWEEN FINGERS POF ZERO/NEGATIVE-CTE MATERIAL AND UNIDIRECTIONAL-CTE MATERIAL, A COMPOSITE CAN BE CONSTRUCTED WHICH ACTS LIKE A HIGH-EFFICIENCY THERMAL CONDUCTOR WHEN THE FLUX IS APPLIED FROM ONE SIDE, AND ACTS LIKE A THERMAL BARRIER WHEN THE FLUX IS APPLIED FROM THE OTHER SIDE. COMPOUNDS IN THE BORON NITRIDE CATEGORY HAVE BEEN TARGETED AS OFFERING DESIRABLE CHARACTERISTICS FOR SUCH A DIODE-LIKE DEVICE. RESEARCH WILL BE CONDUCTED INTO THE USE OF BORON NITRIDE AND SIMILAR COMPOUNDS IN THE CONSTRUCTION OF SUCH A PASSIVE THERMAL ATTENUATOR (PTA).

EXPERT-EASY SYSTEMS INC
1301 SHOREWAY RD - STE 420
BELMONT, CA 94002
CONTRACT NUMBER: N00163-88-C-0024
STEVEN W ENGLE
TITLE:
AUTONOMOUS TARGET RECOGNITION USING NEURAL NETWORKS
TOPIC# 251 OFFICE: NAC/NAVAIR

AN AUTONOMOUS TARGET RECOGNITION SYSTEM, INCORPORATING NEURAL NETS IS PROPOSED. A PROTOTYPE WILL BE DEVELOPED AND EVALUATED IN A VARIETY OF CIRCUMSTANCES TO ASSESS THE SYSTEMS RELIABILITY, TOLERANCE TO SIGNAL NOISE, AND ABILITY TO IDENTIFY OBJECTS GIVEN ONLY ORTHOGONAL VIEWS OF THE TRAINING OBJECTS. THIS APPROACH OFFERS A NUMBER OF ADVANTAGES OVER CURRENT MACHINE VISION TECHNOLOGIES AND IS GENERALIZABLE TO A WIDE VARIETY OF PASSIVE SENSOR SYSTEMS. IT IS ALSO IMPLEMENTABLE IN VLSI CIRCUITS OR OPTICAL COMPUTERS.

FAILURE ANALYSIS ASSOCS
PO BOX 51470 - 2225 E BAYSHORE RD
PALO ALTO, CA 94303
CONTRACT NUMBER:
DR DAVID O HARRIS
TITLE:
COMPUTER PROGRAM TO PREDICT FATIGUE CRACK GROWTH
TOPIC# 74 OFFICE: NAVSEA

SUBMITTED BY

IT IS PROPOSED THAT A PREVIOUS FRACTURE MECHANICS LIFE TECHNOLOGY SURVEY PREPARED BY FAILURE ANALYSIS ASSOCIATES FOR NASA BE UPDATED AND EXTENDED TO A SURVEY FOR CRACK GROWTH IN SUBMARINE HULL STRUCTURAL DETAILS. COMPUTER PROGRAMS FROM THE SURVEY THAT SURVIVE A SCREENING WILL BE EVALUATED IN DETAIL. THOSE SURVIVING THE DETAILED EVALUATION WILL BE BENCHMARKED AGAINST EXPERIMENTAL CASES TO ASSESS THEIR ACCURACY. RECOMMENDATIONS WILL BE MADE FOR RESEARCH REQUIRED TO MEET THE NEEDS OF SUBMARINE HULL STRUCTURES.

FATIGUE TECHNOLOGY INC
150 ANDOVER PARK W
SEATTLE, WA 98188
CONTRACT NUMBER:
MICHAEL A LANDY
TITLE:
REPAIR OF J-52 STRESS CONCENTRATION LOW CYCLE DAMAGE
TOPIC# 232 OFFICE: NAPC/NAVAIR

USE OF THE PATENTED SPLIT SLEEVE COLD EXPANSION (Cx) PROCESS, AND PROCESS VARIATIONS, WILL BE INVESTIGATED AS A MEANS TO EXTEND THE LIFE OF IN-SERIVCE J-52 COMPONENTS DAMAGED BY LOW CYCLE FATIGUE. THESE PROCESSES HAVE BEEN WIDELY USED FOR LIFE EXTENSION OF NEW AND IN-SERVICE AIRFRAME COMPONENTS BUT HAVE NOT BEEN FULLY EVALUATED FOR GAS TURBINE ENGINE APPLICATIONS. THIS PROGRAM WILL DETERMINE THE POTENTIAL FOR LIFE IMPROVEMENT, USING THESE TECHNIQUES, IN GEOMETRIES REPRESENTATIVE OF J-52 STRUCTURES. THESE INCLUDE, BUT ARE NOT LIMITED TO, BOLT HOLES, BLADE ATTACHMENTS, CUTOUTS, AND SCALLOPS. IN GENERAL, THIS PHASE WILL USE TITANIUM 6Al-4V AS A BASE LINE MATERIAL, OPERATING AT TEMPERATURES FROM AMBIENT TO 550 DEG F. IF POSSIBLE, TESTS WILL BE PERFORMED USING J-52 STRUCTURAL COMPONENTS.

FIBER MATERIALS INC
BIDDEFORD INDUSTRIAL PK
BIDDEFORD, ME 04005
CONTRACT NUMBER:
M K MARSHALL
TITLE:
DEVELOPMENT OF HIGH STRENGTH CARBON FIBER/CERAMIC MATR
TOPIC# 228 OFFICE: NAPC/NAVAIR

SUBMITTED BY

CARBON-CARBON COMPOSITES ARE ATTRACTIVE MATERIALS FOR HIGH TEMPERATURE APPLICATIONS BECAUSE THEY ARE LIGHTWEIGHT AND RETAIN STRENGTH AT HIGH TEMPERATURES. HOWEVER, THESE COMPOSITES BECOME SEVERELY OXIDIZED ABOVE 700 DEG F IN AIR OR AN OXIDIZING ENVIRONMENT. PREVIOUS RESEARCH AT FMI INDICATES THAT CERAMIC MATRICES CAN BE INTRODUCED INTO A FIBROUS PREFORM USING SIMILAR PROCESSING TECHNOLOGY TO CARBON-CARBON. VARIOUS PRE-CERAMIC POLYMERS EXIST WHICH YIELD SILICON CARBIDE UPON PYROLYSIS. SILICON CARBIDE IS OUTSTANDING IN TERMS OF THERMAL SHOCK RESISTANCE WHILE THE OXIDATION RESISTANCE AT THE SPECIFIC TEMPERATURE RANGE (2500 DEG F - 4000 DEG F) IS ADEQUATE. THE PURPOSE OF THE PROPOSED PROGRAM IS TO DEMONSTRATE THE DEGREE OF OXIDATION RESISTANCE ACHIEVED IN A CARBON FIBER/CERAMIC MATRIX COMPOSITE AT TEMPERATURES UP TO 4000 DEG F FOR USE ON GAS TURBINE COMPONENTS. THIS MATERIAL, BECAUSE OF THE HIGH STRENGTH, LIGHTWEIGHT AND OXIDATION RESISTANCE, COULD FIND A WIDE RANGE OF APPLICATIONS ON ROCKET MOTORS, SPACE VEHICLES, OR FUTURE GAS TURBINE ENGINES.

FIBERTEK INC
510-A HERNDON PKWY
HERNDON, VA 22070
CONTRACT NUMBER:
DR GARRY SPECTOR
TITLE:
PRESSURE SENSITIVE OPTICAL FIBER SENSOR FOR TORPEDO GE
TOPIC# 62 OFFICE: NAVSEA

A FIBEROPTIC PRESSURE SENSOR IS DESCRIBED, IN WHICH THE SENSOR ELEMENTS ARE PLACED IN THE ROOTS OF VARIOUS GEARS. THIS PERMITS AN ENGINEERING EVALUATION RELATING THE MEASURED PRESSURE AT THE GEARTOOTH-ROOT INTERACTION TO THE PERFORMANCE OF THE GEAR. THE SUBMINIATURE DESIGN OF THE ELECTRONICS PERMITS ATTACHMENT OF THE DETECTOR PACKAGE DIRECTLY ONTO THE ROTATING GEAR. THE DYNAMIC PRESSURE IS CONVERTED TO A FREQUENCY SHIFT OF AN RF TRANSMITTER. THE RF SIGNAL IS PICKED UP BY AN ANTENNA LOCATED INSIDE THE TRANSMISSION HOUSING. DATA RECORDING AND ANALYSIS IS PERFORMED BY A TABLE TOP ELECTRONICS UNIT LOCATED AWAY FROM THE TRANSMISSION GEARS.

FLAM & RUSSELL INC
PO BOX 444
HORSHAM, PA 19044
CONTRACT NUMBER:
LAWRENCE R BURGESS
TITLE:
DIGITAL NULL-STEERING PROCESSOR FEATURING A VARIABLE N
THRESHOLD
TOPIC# 38 OFFICE: SPAWAR

SUBMITTED BY

DEGRADATION OF COMMUNICATION AND DATA LINKS BY THE PRESENCE OF INTENTIONAL AND UNINTENTIONAL INTERFERING SIGNALS IS A MAJOR PROBLEM IN TACTICAL ENVIRONMENTS. THE USE OF HIGH SPEED DIGITAL PROCESSORS TO CONTROL ADAPTIVE NULLING ARRAYS AND INTERFERENCE CANCELLERS IS A NECESSARY COMPLEMENT TO CURRENT SPREAD SPECTRUM AND FILTERING TECHNIQUES. THIS PROGRAM FEATURES THE DEVELOPMENT OF A HIGH SPEED DIGITAL PROCESSOR WHICH COMBINES THE NORMALLY MUTUALLY EXCLUSIVE FEATURES OF FAST CONVERGENCE AND DEEP NULLING, WHILE PROVIDING DYNAMIC OPTIMIZATION OF THE SIGNAL TO NOISE RATIO. THE PROPOSED METHOD OF DYNAMIC S/J+N OPTIMIZATION IS TO VARY A NULLING THRESHOLD LEVEL. SIGNALS OF POWER LEVELS BELOW THE THRESHOLD ARE NOT NULLED BY THE PROCESSOR/ NULL-FORMING ARRAY. THE ATTRACTIVE FEATURE OF THIS METHOD OF DESIRED SIGNAL PROTECTION IS THAT IS REQUIRES NEITHER DIRECTION OF ARRIVAL NOR WAVEFORM APRIORI INFORMATION, TWO QUANTITIES THAT OFTEN ARE NOT AVAILABLE IN TACTICAL SITUATIONS. THE KEY TECHNICAL OBJECTIVES ARE TO DEVELOP AN ALGORITHM WITH THE FEATURES DESCRIBED ABOVE, AND TO DEVELOP THE NECESSARY RF/DIGITAL ARCHITECTURE TO IMPLEMENT IT A LOW COST. THE SIMULTANSOUS ACQUISITION OF ALL THESE PERFORMANCE CHARACTERISTICS WOULD ADVANCE THE STATE-OF-THE-ART SIGNIFICANTLY.

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER:
DR H -T PETER LIU
TITLE:
AN OPTICAL METHOD FOR ACCURATE MEASUREMENT OF PARTICLE TRAJECTORIES IN HIGH-SPEED FLOWS
TOPIC# 200 OFFICE: NUSC

THE DEVELOPMENT OF AN OPTICAL METHOD IS PROPOSED FOR THE IMMEDIATE APPLICATION OF INVESTIGATING THE EFFECTS OF SMALL PARTICLES ON THE EVOLUTION OF A LAMINAR BOUNDARY LAYER FORMED AS FLOW PASSES THE NOSE OF AN UNDERWATER VEHICLE. DURING PHASE I, WE WILL DEMONSTRATE THE FEASIBILITY OF DEVELOPING SUCH A METHOD. A TWO-DIMENSIONAL FLOW FACILITY, WITH A STREAMLINED OBSTACLE TO SIMULATE THE FLOW PAST AN UNDERWATER VEHICLES, WILL BE ASSEMBLED FOR THE PHASE I DEMONSTRATION. NEARLY NEUTRALLY BUOYANT MICROCAPSULES FILLED WITH A FLUORESCENT DYE SOLUTION WILL BE USED AS THE PARTICLES. A SHEET OF LASER LIGHT WILL

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ILLUMINATE THE FLOW FIELD. THE POSITIONS AND THUS THE TRAJECTORIES OF THE PARTICLES WILL BE RECORDED WITH A TWO-DIMENSIONAL PHOTODIODE ARRAY CAMERA CONSISTING OF 128 X 128 PIXELS. TO MAXIMIZE THE FIELD OF VIEW WITHOUT SACRIFICING THE RESOLUTION, WE WILL INTENTIONALLY BLURR THE IMAGES OF THE PARTICLES TO COVER 10 TO 20 PIXELS, WHICH HAS BEEN SHOWN TO IMPROVE SIGNFICANTLY THE RESOLUTION OF THE ARRAY CAMERA. UP TO 10 FRAMES OF CAMERA OUTPUT WILL BE STORED ON FAST STATIC RAM CHIPS VIA A FLASH ANALOG-TO-DIGITAL INTERFACE. THE DATA WILL BE TRANSFERRED TO A HARD DISK OF A MICROCOMPUTER. SOFTWARE WILL BE DEVELOPED FOR DATA ACQUISITION AND ANALYSIS TO DETERMINE THE PARTICLE TRAJECTORIES, VELOCITIES AND ACCELERATIONS. EXTENSION OF THE METHOD TO MEASUREMENTS IN A THREE-DIMENSIONAL FLOW FIELD MAY BE MADE IN PHASE II BY USING A TWO-CAMERA STEREOSCOPIC SYSTEM.

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER: N00164-87-C-0235
DR ALAN MUELLER
TITLE:
MICRO/MACRO MECHANICS FOR COMPOSITE FRACTURE CRITERIA
TOPIC# 179 OFFICE: NWSC/SSPO

ALTHOUGH STRONG IN THE LAMINATE PLANE, COMPOSITES EXHIBIT WEAK INTERLAMINAR PROPERTIES. AS A RESULT, DELAMINATIONS CAN OCCUR DURING MANUFACTURING OR IN SERVICE ENVIRONMENTS. THIS PROPOSAL ADDRESSES A NEED FOR FRACTURE CRITERIA MODELS FOR BOTH ORGANIC AND METAL MATRIX COMPOSITES. A MAJOR OBJECTIVE IS TO ANALYZE AND COMPARE FRACTURES IN MICROSCOPIC AND MACROSCOPIC GEOMETRIES USING A SINGULAR FINITE ELEMENT METHOD. THE RESULTS OF THIS ANALYSIS WILL BE USED TO DEVELOP A MIXED-MODE, MACROSCOPIC FRACTURE CRITERIA ANALYTICAL MODEL THAT INCORPORATES MICROSCOPIC TOUGHENING MECHANISMS.

FLOW RESEARCH CO
21414 - 68TH AVE S
KENT, WA 98032
CONTRACT NUMBER:
DR R P TURCOTTE
TITLE:
DEVELOPMENT OF HIGH TEMPERATURE OXIDES WITH SUPPRESSED DIFFUSIVITY
TOPIC# 228 OFFICE: NAPC/NAVAIR

SUBMITTED BY

THE SUCCESSFUL DEVELOPMENT OF HIGH-TEMPERATURE CERAMICS OR CERAMIC COMPOSITES FOR USE IN COMBUSTION ENGINE ENVIRONMENTS WILL REQUIRE DEVELOPMENT OF THERMODYNAMICALLY STABLE OXIDES FOR PROTECTIVE COATINGS OR AS THE MATRIX MATERIAL IN WHISKER- OR FIBER-TOUGHENED COMPOSITES. THIS PROGRAM WILL DEVELOP CUBIC FLUORITE RELATED OXIDES (BASED ON Y[2]O[3]) WITH STRUCTURES MODIFIED BY SELECTED DOPING. THE MODIFICATIONS SHOULD REDUCE OXYGEN DIFFUSIVITY BY TWO TO FOUR ORDERS OF MAGNITUDE. IF THIS CAN BE ACHIEVED, THIS OXIDE MAY PROVIDE OXIDATION PROTECTION TO MUCH HIGHER TEMEPRATURES THAN CURRENTLY POSSIBLE, WHILE RETAINING A HIGH THERMODYNAMIC STABILITY. THE MATERIALS DEVELOPED MAY EXTEND THE USE OF SUPERALLOYS, SiC, Si(3)N(4) OR CARBON FIBER BASED CERAMICS TO THE HIGHEST POSSIBLE TEMPERATURES, IN COMBUSTION ZONE ENVIRONMENTS.

FLUOROCHEM INC
680 S AYON AVE
AZUSA, CA 91702
CONTRACT NUMBER:
KURT BAUM
TITLE:
ENVIRONMENTALLY STABLE FLUOROPOLYMERS
TOPIC# 7 OFFICE: ONR

A SERIES OF NEW DIFUNCTIONAL FLUORINATED MONOMERS WILL BE SYNTHESIZED. THESE MATERIALS WILL BE USED TO PREPARE ENVIRONMENTALLY STABLE POLYMERS.

FLUOROCHEM INC
680 S AYON AVE
AZUSA, CA 91702
CONTRACT NUMBER:
LEE C GARVER
TITLE:
SYNTHESIS PROCESS FOR BIO(DINITROPROPYL) FORMAL/DINITR
DINITROPROPYL FORMAL PLASTICIZER (BDNPF/DNBPF)
TOPIC# 157 OFFICE: NSWC

PROCESS DEVELOPMENT STUDIES WILL BE CARRIED OUT FOR THE PRODUCTION

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OF MIXTURES OF BIS(DINITROPROPYL) FORMAL AND DINITROBUTYL DINITROPROPYL FORMAL FROM MIXTURES OF NITROETHANE AND L-NITROPROPANE. MIXED PLASTICIZERS BASED ON ETHERS RATHER THAN FORMALS WILL ALSO BE STUDIED.

FOSTER-MILLER INC
350 SECOND AVE
WALTHAM, MA 02254
CONTRACT NUMBER:
W E SCHROEDER
TITLE:
IMPROVED OPTICAL TRACKING PROCESSOR
TOPIC# 132 OFFICE: NSWC

MUCH WORK HAS BEEN DONE OF LATE IN OPTICAL TARGET TRACKING. THE BULK OF IT HAS INVOLVED CENTROID TRACKING, ROSETTE SCANNING, EDGE TRACKING, AND "INTELLIGENT TRACKING ALGORITHMS" SUCH AS BAYESIAN ALGORITHMS AND OTHER STATISTICAL METHODS. ALL OF THESE METHODS SUFFER FROM FLAWS THAT MAKE THE RESULTANT TRACKING SYSTEMS VULNERABLE TO SIMPLE COUNTERMEASURES. THE SIMPLEST, AND MOST EFFECTIVE COUNTERMEASURE IS FOUNDED IN THE CREATION OF ARTIFACT IN THE SCENE. THE PROPOSED PROTOTYPE TRACKING SYSTEM OVERCOMES THE ARTIFACT PROBLEM QUITE WELL. THE HARDWARE BASED ISCAN TARGET TRACKER PROVIDES AUTOMATIC ARTIFACT ELIMINATION BY TRACKING THE GEOMETRIC CENTER OF THE LARGEST SINGLE TARGET WHILE IGNORING ALL OTHER APPARENT TARGETS IN THE FIELD OF VIEW IMAGED ON THE SENSOR ARRAY. THE FACT THAT THE BASIC TRACKING ALGORITHM HAS BEEN IMPLEMENTED IN SILICON, MEANS THAT IT IS ALSO FAST. IT CAN PROCESS A FULL 1024 X 512 ARRAY IN 5 MSEC (200 fps) OUTPUTTING TARGET POSITION AND SIZE DATA WITH 9 BIT RESOLUTION. THE PURPOSE OF THIS PROPOSED SBIR PROGRAM IS TO DEMONSTRATE THE EFFECTIVENESS OF THE ISCAN TARGET TRACKER AND TO EXPERIMENT WITH VARIOUS FRONT END AND POST PROCESSING ROUTINES TO PROVIDE DEMONSTRATION OF THE WIDEST POSSIBLE RANGE OF COUNTERMEASURES.

FRONTIER ENGINEERING INC
424 SQUIRES ST
STILLWATER, OK 74074
CONTRACT NUMBER:
LES HOY
TITLE:
DESIGN OF AN AUTOMATED BEST SIGNAL SOURCE COMBINER
TOPIC# 215 OFFICE: PMTC/NAVAIR

SUBMITTED BY

CURRENT BEST TELEMETRY SOURCE COMBINER SYSTEMS USED AT WEAPONS TEST RANGES ARE CAPABLE OF SELECTING THE "BEST" SIGNAL FROM SEVERAL REDUNDANT SOURCES. HIGHER DATA RATES AND DETERIORATION OF TEST RANGE SNRs HAVE PRECIPITATED A REQUIREMENT FOR AN AUTOMATED TELEMETRY SIGNAL PROCESSING SYSTEM CAPABLE OF COMBINING AVAILABLE SOURCES INTO AN ENHANCED "BEST SIGNAL."

FUZETRON INC
10303 CENTINELLA DR
LA MESA, CA 92041
CONTRACT NUMBER:
DR THOMAS W OAKES
TITLE:
PROTECTIVE MARINE COATING SYSTEMS COMPATABLE WITH VOC REGULATIONS
TOPIC# 116 OFFICE: NSWC

PROBLEM: THE PROTECTIVE MARINE PAINT SYSTEMS IN USE BORDER ON VIOLATING THE VOLATILE ORGANIC COMPOUND (VOC) EMISSION REGULATIONS AND BY NATURE ARE HARMFUL TO THE ENVIRONMENT. REPLACEMENT COATING SYSTEMS ARE NEEDED. THE REPLACEMENT SYSTEM MUST BE DURBLE, PROTECTIVE, SAFE FOR ENVIRONMENTAL REGULATIONS, AND BE TECHNICALLY EASY TO APPLY IN A VARIETY OF LOCATIONS. THIS PROJECT DEMONSTRATES HOW 'POWDER COATING' MATERIALS, PROCEDURES, AND TECHNIQUES CAN SATISFY THESE REQUIREMENTS, AND SERVE THE NAVY AND PRIVATE INDUSTRY AS A VALUABLE REPLACEMENT COATING SYSTEM. PROJECT OBJECTIVES ARE 1) MATERIALS (COATING & ADDITIVE) SELETION BAISED ON CRITERIA TO MEET EMISSION SAFTY STANDARDS. 2) INVESTIGATE AT LEAST 5 INNOVATIVE WAYS TO CURE POWDER FOR ON-SIGHT APPLICATION. (RADIANT - INFRARED, ULTRA VIOLET, PLASMA SPRAYON, LASER HEARING.) 3) DOCUMENT THE FACT THAT POWDER COATING SYSTEMS MEET REQUIREMENTS (VOC, S-F BAAQB, ETC.) FUZETRON HAS EXPERIENCE IN DESIGNING AND APPLYING POWDER COATINGS AND HAS EQUIPMENT ON HAND FOR SUCH APPLICATION. THIS EXPERIENCE AND KNOWLEDGE WILL BE APPLIED TO MAKING A MARINE COATING SYSTEM TO MEET THE PRESENT CRITERIA AND REGULATIONS.

GAERTNER W W RESEARCH INC
205 SADDLE HILL RD
STAMFORT, CT 06903
CONTRACT NUMBER:
DR W W GAERTNER
TITLE:
DETAILED EVALUATION OF NOVEL HEAT ATTITUDE SENSOR
TOPIC# 217 OFFICE: NTSC/NAVAIR

SUBMITTED BY

IT IS PROPOSED TO USE PHASE I TO ASSESS THE APPLICABILITY OF A NEW ULTRASONIC HEAD-TRACKER SYSTEM DEVELOPED FOR HELICOPTER USE BY AEG, A PROTOTYPE OF WHICH COULD BE MADE AVAILABLE TO W.W. GAERTNER RESEARCH, INC. FOR THIS TEST. IF THE ACCURACY OF THE ORIGINAL PROTOTYPE IS NOT ADEQUATE, SEVERAL DESIGN IMPROVEMENTS ARE SUGGESTED WHICH COULD BE IMPLEMENTED UNDER PHASE II.

GENERAL MANAGEMENT SYSTEMS INC
PO BOX 4002
FALLS CHURCH, VA 22044
CONTRACT NUMBER:
DAVID A JOSEPH
TITLE:
EXTENDED FLIGHT ANALYSIS
TOPIC# 261 OFFICE: NAVAIR/NATC

THE OBJECTIVES OF THIS PROJECT ARE TO COLLECT RELEVANT HISTORICAL AND CURRENT DATA AND CREATE A DATABASE OF INFORMATION RELATING TO THE TECHNICAL AND HUMAN FACTORS ISSUES THAT ARISE IN SITUATIONS WHERE CREWS MUST WORK FOR EXTENDED PERIODS OF TIME IN CONFINED SPACES. BY ANALYZING THE DATA USING APPROPRIATE TECHNIQUES, PROPOSED METHODOLOGIES ARE TO BE DEVELOPED TO FORMULATE POSSIBLE SOLUTIONS TO ANTICIPATED PROBLEMS THAT MAY OCCUR WHEN OPERATING CREWS OF UP TO TWENTY-FOUR PERSONS FOR CONTINUOUS TIME PERIODS OF UP TO SEVERAL WEEKS IN VEHICLES WITH CONFINED SPACE SUCH AS AIRSHIPS.

GEOPHEX LTD
5100 HOLLY SPRINGS RD
RALEIGH, NC 27606
CONTRACT NUMBER:
I J WON/ANTHONY ROUTLEDGE
TITLE:
APPLICATION OF THE AIRBORNE ELECTROMAGNETIC METHOD TO DETECTION
TOPIC# 22 OFFICE: ONT

GEOPHEX, LTD. PROPOSES TO DEVELOP AN AIRBORNE ELECTROMAGNETIC (AEM) SYSTEM DEDICATED TO THE DETECTION OF SUBMARINES IN THE OCEAN (TOPIC

SUBMITTED BY

NO. N87-22, THE DOD SBIR PROGRAM, 1987). THE AEM METHOD HAS RECENTLY EMERGED AS A VIABLE TECHNIQUE FOR AIRBORNE CHARTING OF WATER DEPTH (IN EXCESS OF PERHAPS 100 M), WATER CONDUCTIVITY (THUS, SALINITY AND TEMPERATURE VARIATIONS), AND BOTTOM SEDIMENT CONDUCTIVITY (THUS, DENSITY, POROSITY, AND SEDIMENT TYPES). DURING TWO RECENT EXPERIMENTAL AEM FLIGHTS FOR BATHYMETRIC MISSIONS, THE METHOD HAS PROVED TO BE ABLE TO PROFILE MINUTE CHANGES IN WATER CONDUCTIVITY. THE ABILITY OF THE AEM METHOD TO PROFILE WATER CONDUCTIVITY LEADS US TO BELIEVE THAT THE METHOD CAN BE ADAPTED TO A SUBMARINE DETECTION MISSION. SPECIFICALLY, IT SHOULD BE ABLE TO LOCATE THE DISTURBANCE PLUME WHICH TAILS BEHIND SUBMARINES. THIS CONDUCTIVITY DISTURBANCE PLUME, WHICH MAY BE OF CONSIDERABLE LENGTH, CAN BE AN EASILY TRACKABLE TARGET FOR AN AEM SURVEY. IN THIS PROPOSAL, WE SHOW THEORETICAL STUDIES AND EXPERIMENTAL RESULTS PERFORMED BY GEOPHEX TO SUPPORT OUR CLAIM.

GMP ASSOCS
110 PLEASANT VIEW DR
CLEMSON, SC 29631
CONTRACT NUMBER:
HAROLD C GROSSMAN
TITLE:
FEASIBILITY STUDY FOR A WIDE AREA NETWORK
TOPIC# 99 OFFICE: NAVAIR/SC

THE GOAL OF THIS RESEARCH IS TO DEVELOP INNOVATIVE APPROACHES COMBINING THE LATEST TECHNOLOGY IN COMPUTERS, COMMUNICATIONS AND SOFTWARE TO IMPLEMENT A WIDE AREA NETWORK LINKING DIVERSE NAVY AGENCIES. THE NETWORK WILL PROVIDE REMOTE ACCESS TO A COMPUTER SYSTEM WHICH, IN TURN, PROVIDES THE FOLLOWING GENERIC CAPABILITIES: 1. REMOTE LOGIN; 2. ELECTRONIC MAIL; 3. FILE TRANSFERS. A MASTER PLAN FOR THE NETWORK WILL BE DEVELOPED AND A PROTOTYPE VERSION OF THE NETWORK WILL BE IMPLEMENTED TO DEMONSTRATE CONCEPT FEASIBILITY.

GROSS T A O INC
230 CONCORD RD
LINCOLN, MA 01773
CONTRACT NUMBER:
T A O GROSS
TITLE:
SPLIT TRANSFORMER PERFORMANCE MODELING
TOPIC# 195 OFFICE: NUSC

SUBMITTED BY

THE PERFORMANCE OF ANNULAR AND TOROIDAL SPLIT TRANSFORMERS OPERATING IN SEAWATER WILL BE COMPARED BY MEANS OF WATER-TANK EXPERIMENTS AND BY FLUX MAPPING WITH A COMPUTER. AN EQUATION WILL BE DEVELOPED FOR THE PREFERRED CONSTRUCTION WHICH WILL DESCRIBE THE COUPLING CO-EFFICIENT AND TRANSMISSION LOSSES AS A FUNCTION OF SEPARATION, SEA WATER CONDUCTIVITY, AND "DISORIENTATION."

HANNIGAN COMPUTER APPLICATIONS CO
RTE 2 - BOX 250
WARRENTON, VA 22186
CONTRACT NUMBER:
FRANK J HANNIGAN
TITLE:
EXPERT SYSTEM FOR DIRECTING PROPULSION TECHNOLOGY
TOPIC# 227 OFFICE: NAPC/NAVAIR

EXPERT SYSTEM TECHNOLOGY HAS GROWN OVER THE LAST 15 YEARS INTO A VIABLE TECHNICAL CAPABILITY. ITS PRIMARY PURPOSE IS TO ALLOW PERSONNEL INVOLVED IN A TECHNICAL DISCIPLINE TO TAKE FULL ADVANTAGE OF PREVIOUS KNOWLEDGE AND EXPERIENCE THAT EXISTS WITHIN THIS DISCIPLINE. THE EXPERT SYSTEM PROVIDES NOT ONLY A LARGE AMOUNT OF DATA AND KNOWLEDGE, BUT ALSO AN INTELLIGENT INTERPRETATION AND PRESENTATION OF THIS INFORMATION. PHASE I HAS AS ITS PRIMARY GOAL AN EVALUATION OF EXISTING CAPABILITIES WITHIN THE FIELD OF ARTIFICIAL INTELLIGENCE (AI) AND THEIR POSSIBLE ROLES IN ASSISTING FUTURE PROPULSION TECHNOLOGY. WITHIN THE SCOPE OF THIS STUDY WILL BE THE GENERATION OF EXAMPLE KNOWLEDGE AND DATA BASES FROM COMPONENT EXPERTS AND OPERATIONS PERSONNEL, RECOMMENDATIONS REGARDING MOST PROMISING AVAILABLE HARDWARE AND SOFTWARE, THE DEVELOPMENT OF AN EXAMPLE SYSTEM AND DETAILED RECOMMENDATIONS FOR THE DESIGN OF A FULL-SCALE EXPERT SYSTEM IN PHASE II.

HARVEY ASSOCS
19 GLEN LN
RANDOLPH, MA 02368
CONTRACT NUMBER:
HARVEY K SEGAL
TITLE:
ARCTIC METEOR BURST COMMUNICATIONS
TOPIC# 40 OFFICE: SPAWAR

SUBMITTED BY

OUR PROPOSED EFFORT WILL BE TO: RAISE TECHNICAL ISSUES IN ICE-PENETRATION TECHNIQUES AND THE APPLICATION OF METEOR BURST COMMUNICATIONS TECHNOLOGY TO EXPENDABLE BUOYS; EVALUATE VARIOUS TECHNICAL APPROACHES IN RESOLVING THOSE ISSUES AS HAVING BEEN PROPOSED BY OTHER WORKERS; EXPLORE ALL AVENUES WHICH MAY LEAD TO SOLUTIONS OF THOSE TECHNICAL PROBLEMS. WE ARE PROPOSING A PHASE I WORK PLAN AS A STRAWMAN LEAVING SUFFICIENT FLEXIBILITY FOR RE-SCHEDULING AND RE-EMPHASIS IN ORDER TO BE EFFECTIVELY COORDINATING WITH CURRENT EFFORT AS NEEDED BY THE SPONSOR. THE SCOPE OF WORK INCLUDES ALSO THE COMPILATION OF ENVIRONMENTAL DATA PERTAINING TO METEOR BURST COMMUNICATIONS IN ARCTIC, AND A SIMULATION OF REPORTBACK SYSTEM OPERATION BY CALCULATING THE INTER-DEPENDENCE AMONG TECHNICAL FEATURES SUCH AS ANTENNA GAIN, TRANSMITTED POWER, BURST RATE, MESSAGE LENGTH ETC., OF THE BUOY AS WELL AS THE SPECIFIED CHARACTERISTICS OF THE MASTER STATION.

HI-TECH INC
200 BIBB AVE
AUBURN, AL 36830
CONTRACT NUMBER:
FRED H CARLEY
TITLE:
NAVY PACKAGING IMPROVEMENT STUDY
TOPIC# 151 OFFICE: NSWC

THIS PROPOSAL IS TO INVESTIGATE CURRENT PACKAGING AND LABELING PRACTICES IN THE NAVY AND DEVELOP RECOMMENDATIONS AND CONCEPTS FOR COST-EFFECTIVE IMPROVEMENTS. FOCUS WILL BE ON TECHNOLOGICAL ADVANCEMENTS IN MARKING AND LABELING PRACTICES AND EQUIPMENT, AND MATERIALS THAT WILL PROVIDE ADDITIONAL PROTECTION TO INSENSITIVE MUNITIONS FROM UNPLANNED STIMULI, AS WELL AS INNOVATIVE CONTAINER CONCEPTS THAT MAY IMPROVE THEIR UTILITY TO THE NAVY. THE PHASE I INVESTIGATION WILL BE A DATA COLLECTION AND ANALYSIS EFFORT TO IDENTIFY SPECIFIC OPPORTUNITIES FOR IMPROVEMENT. THE PHASE II, INDEPTH STUDY WILL CONCENTRATE ON THOSE SPECIFIC OPPORTUNITIES IDENTIFIED IN PHASE I, AND PROVIDE DETAILED RECOMMENDATIONS AND CONCEPTS FOR APPLYING NEW MATERIALS AND CONTAINER DESIGNS WHICH HAVE SUBSTANTIAL POTENTIAL FOR BENEFITTING NAVY LOGISTICS AND OPERATIONS.

HIGH TECHNOLOGY SENSORS INC
262 E HORNBEAM DR
LONGWOOD, FL 32779
CONTRACT NUMBER:
RALPH M MINDOCK
TITLE:
MINIATURE RESPIRATORY SENSOR
TOPIC# 97 OFFICE: NAVMED

SUBMITTED BY

HIGH TECHNOLOGY SENSORS IS PROPOSING TO DEVELOP A MINIATURE NDIR SENSOR FOR THE PURPOSE OF MEASURING RESPIRATORY FUNCTIONS OF A NAVAL AVIATOR. THE SENSOR WILL FIT IN A SMALL EXTENSION OF THE AVIATOR'S MASK AND WILL UTILIZE AN ALL SOLID STATE INFRARED SOURCE DEVELOPED BY HIGH TECHNOLOGY SENSORS. A BREADBOARD SENSOR WILL BE DESIGNED, FABRICATED AND TESTED AS PART OF THE PHASE I PROGRAM.

HOGMAN M N
6529 106TH AVE NE #6
KIRKLAND, WA 98033
CONTRACT NUMBER:
MEDFORD N HOGMAN
TITLE:
LOW FREQUENCY UNDERWATER SOUND CALIBRATION SOURCE
TOPIC# 60 OFFICE: NAVSEA

A LOW FREQUENCY, NON-EXPLOSIVE, SOUND SOURCE THAT USES A RADIALLY-POLED, CERAMIC, CYLINDRICAL TRANSDUCER AND OPERATES IN FLEXURAL MODES IS PROPOSED. THE TRANSDUCER IS STRIPED INTO 4 QUADRANTS. ALTERNATE QUADRANTS ARE DRIVEN IN-PHASE AND LOADED INTO THE WATER THEREBY ENHANCING ACOUSTIC PERFORMANCE AT THE LOW FREQUENCY FUNDAMENTAL FLEXURAL MODE. THE TRANSDUCER IS INSTALLED INTO A 3.5 INCH DIAMETER BY 18 INCH LONG CYLINDRICAL HOUSING. PHASE I EFFORTS ARE DIRECTED AT DEMONSTRATING THE EFFICIENCY OF THIS TRANSDUCER CONFIGURATION AND ASSESSING ITS PERFORMANCE AT DEPTH. PHASE II EFFORTS WILL BE DEVOTED TO MAXIMIZING THE EFFICIENCY OF THIS COMPOSITE TRANSDUCER AND TO ITS PACKAGING FOR SHALLOW OR DEEP WATER APPLICATIONS AS A 500 HERTZ, 1 WATT SOUND SOURCE.

HOKENSON CO
840 S TREMAINE AVE
LOS ANGELES, CA 90005
CONTRACT NUMBER:
DR GUSTAVE J HOKENSON
TITLE:
VARIABLE-ENERGY EJECT FOR MISSILE LAUNCH OVER A WIDE R
TOPIC# 249 OFFICE: DTNSRDC

SUBMITTED BY

UTILIZING EXISTING NUMERICAL SIMULATION TOOLS DEVELOPED BY THE PRINCIPAL INVESTIGATOR AND THE HOKENSON COMPANY, TWO ACTIVE CONTROL CONCEPTS APPLIED TO THE SUBMARINE MISSILE LAUNCH ASSIST GAS GENERATOR SYSTEM SHALL BE MODELED. THE OBJECTIVE IS TO QUANTIFY THE ABILITY OF THE TWO STRATEGIES TO CONTROL THE EJECTION FLOWRATE AND PRESSURE, THUS ADMITTING THE POSSIBILITY FOR LAUNCHING MISSILES OVER A WIDE RANGE OF DEPTHS. THE FIRST MECHANISM TO BE STUDIED IS THE INJECTION OF PRESSURE WAVES OF VARIOUS AMPLITUDES AND FREQUENCIES INTO THE COMBUSTION CHAMBER IN ORDER TO MODIFY THE SOLID PROPELLANT SURFACE REGRESSION RATE AND RESULTANT FLOWRATE, TEMPERATURE AND PRESSURE WITH A FIXED MOTOR GEOMETRY. THE SECOND MECHANISM INVOLES CONTROLLING THE WATER INJECTION CHARACTERISTICS INTO THE U-TUBE MIXER/COOLER DOWNSTREAM OF THE GAS GENERATOR. THE ANGLES (SWIRL AND STREAMWISE INCLINATION TO THE MAIN FLOW), FLOWRATE, VELOCITY AND INITIAL ATOMIZATION OF THE WATER INJECTION ON THE DOWNSTREAM PRESSURE AND TEMPERATURE SHALL BE COMPUTED FOR A GIVEN INLET GAS FLOWRATE, PRESSURE AND TEMPERATURE. THESE TWO SETS OF NUMERICAL SIMULATIONS SHALL BE CARRIED OUT WITH THE TIME-DEPENDENT AND MULTI-DIMENSIONAL EQUATIONS OF MOTION. THE RESULTS SHALL SERVE TO VALIDATE AND QUANTIFY THE HYPOTHESIS THAT VARIABLE-ENERGY EJECT SYSTEMS CAN BE DESIGNED WITH CURRENT TECHNOLOGY. IN ADDITION, THE PHASE I STUDIES SHALL SERVE TO LAY THE FOUNDATION FOR THE PHASE II EXPERIMENTAL VALIDATION WORK AS WELL AS A COMPREHENSIVE SET OF COMPUTATIONS IN WHICH BOTH CONTROL FEATURES ARE IMPOSED SIMULTANEOUSLY.

HOLTGREN INC
PO BOX 262
KENILWORTH, NJ 07033
CONTRACT NUMBER:
EDWARD R BUCHANAN
TITLE:
J-52 BOLT HOLE REPAIR USING A SHAPE MEMORY ALLOY EXPAN
TOPIC# 232 OFFICE: NAPC/NAVAIR

THIS PROJECT PROPOSES TO REPAIR FATIGUE DAMAGE IN J-52 COMPRESSOR DISCS USING A NICKEL-TITANIUM "SHAPE MEMORY" ALLOY EXPANSION BUSHING. BUSHING INSERTS OF CONVENTIONAL ALLOY MATERIALS CAN RESULT IN SIGNIFICANT IMPROVEMENTS IN FATIGUE STRENGTH AT AMBIENT TEMPERATURES WHEN THE MATERIAL SURROUNDING THE BOLT HOLE IS INITIALLY COLD EXPANDED TO

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PLACE IT IN COMPRESSION. THE COMPRESSIVE STRESSES SO DEVELOPED WILL RELAX TO SOME DEGREE AT THE ELEVATED TEMPERATURES AT WHICH COMPRESSOR DISCS OPERATE, AND IT CAN BE EXPECTED THAT THE EFFECTIVENESS OF THE CONVENTIONAL BUSHING WOULD DIMINISH OVER A PERIOD OF TIME. IT IS FELT THAT "SHAPE MEMORY" ALLOY BUSHINGS, BY MAINTAINING THIS COMPRESSIVE STRESS, WILL RESULT IN PROLONGED EFFECTIVENESS AT ELEVATED TEMPERATURES. THE USE OF "SHAPE MEMORY" ALLOY BUSHINGS WOULD HAVE SEVERAL OTHER ADVANTAGES, SUCH AS UTILIZATION FOR SMALL HOLES. THIS PROGRAM PROPOSES TO COMPARE THE FATIGUE STRENGTH OF TEST SPECIMENS CONTAINING EITHER CONVENTIONAL OR "SHAPE MEMORY" BUSHINGS, BOTH AS-MANUFACTURED AND AFTER ELEVATED TEMPERATURE EXPOSURE.

HOOVER KEITH & BRUCE INC
11381 MEADOWGLEN - STE I
HOUSTON, TX 77082
CONTRACT NUMBER:
HERBERT L KUNTZ
TITLE:
NOISE CONTROL BIBLIOGRAPHY
TOPIC# 78 OFFICE: NAVSEA

AT PRESENT, WHEN A RESEARCHER OR ENGINEER NEEDS EXTENSIVE INFORMATION ON WORK THAT HAS BEEN DONE IN AN AREA OF NOISE CONTROL, HE MUST ACCESS SEVERAL ON-LINE DATABASES OR MANUALLY SEARCH IN THE LIBRARY FOR THE REQUIRED INFORMATION. THE DATABASES MAY HAVE THE DISADVANTAGES OF GENERATING TOO MUCH INFORMATION BY CROSS-REFERENCING TOO FREELY OR OF NOT HAVING DETAILED ENOUGH INFORMATION FOR THE EVALUATION OF THE WORK BY NOT INCLUDING AN ABSTRACT. WE OFFER TO DEVELOP AN ANNOTATED BIBLIOGRAPHY OF INFORMATION ON THE OPEN NOISE CONTROL LITERATURE. THIS BIBLIOGRAPHY SHALL INCLUDE THE SPECIFIC AREAS OF MACHINERY QUIETING, MEASUREMENT AND ANALYSIS TECHNIQUES, ACOUSTICAL MATERIALS, AND EFFECTS OF NOISE ON PEOPLE. THE SOURCES OF INFORMATION SHALL BE ON-LINE DATABASES AND MANUAL SEARCHES OF STANDARD INDICIES AND PROCEEDINGS OF NOISE CONTROL CONFERENCES. WHERE AN ABSTRACT DOES NOT EXIST, A COPY OF THE ARTICLE SHALL BE ACQUIRED AND AN ABSTRACT WRITTEN. IN PHASE I WE SHALL COMPILE A SINGLE YEAR DATABASE, PREPARE NECESSRY ABSTRACTS, DECIDE ON THE INDEXING AND RETRIEVAL METHODS FOR THE DATABASE, AND DEMONSTRATE A WORKING RETRIEVAL SYSTEM.

HORRIGAN ANALYTICS
1460 N SANDBURG TER
CHICAGO, IL 60610
CONTRACT NUMBER:
TIMOTHY J HORRIGAN
TITLE:
THE BEHAVIOR AND DESIGN OF MULTIPLACE CONFIGURED MINEF
TOPIC# 18 OFFICE: ONT

SUBMITTED BY

A MULTIPLACE MINEFIELD DESIGN IS A SERIES OF MINEFIELD DESIGNS; THAT IS, A SERIES OF SPECIFICATIONS, ONE FOR EACH OF THE COMPONENT MINEFIELDS OF A MULTIPLACE MINEFIELD, OF THE CORRESPONDING MINEABLE AREA AND OF THE NUMBERS AND KINDS OF MINES AND THEIR DISTRIBUTIONS OF SETTINGS THAT ARE TO BE LAID IN IT. DESIGNING MULTIPLACE MINEFIELDS IS THE CORE OF MULTIPLACE MINEFIELD PLANNING, THE ENTIRE STOCKPILE-TO-TARGET-PLACE SEQUENCE FOR ASSEMBLING, TRANSPORTING, AND DELIVERING THE MINES THAT CONSTITUTE A MULTIPLACE MINEFIELD. GIVEN THE CONSTRAINTS ON THE KINDS AND QUANTITIES OF MINES AND ON THE DELIVERY EFFORT AVAILABLE, MULTIPLACE MINEFIELD DESIGN EMPLOYS THE MATHEMATICS APPROPRIATE FOR CONFIGURED SHIP-MINE INTERACTIONS AT EACH OF THE COMPONENT MINEFIELDS SO AS TO DETERMINE THE KINDS, QUANTITIES, AND SETTINGS OF MINES AT EACH COMPONENT MINEFIELD NEEDED TO MAXIMIZE OVERALL PENETRATION CONTROL AS QUANTIFIED BY THE ASSOCIATED FAMILY OF MULTIPLACE STOPPED PENETRATION PROBABILITY DENSITIES. MULTIPLACE MINEFIELD DESIGN, IN GENERAL, IS IN PART A NONLINEAR MATHEMATICAL PROGRAMMING PROBLEM THAT MUST INCLUDE DYNAMIC ALLOCATION OF CASUALTY TOLERANT AND OF COUNTERMEASURE RESOURCES AND IN PART A VERY DIFFICULT ANALYTICAL AND COMPUTATIONAL PROBLEM IN MULTIPLE-CLASS, MULTIPLE-SIGNATURE CONFIGURED MINEFIELD THEORY. DEVELOPING THE MULTIPLACE MINEFIELD THEORY NECESSARY TO DESIGN EFFECTIVE MULTIPLACE COMBAT MINEFIELDS, TO DETERMINE STOCKPILE REQUIREMENTS, AND TO COMPARE REALISTICALLY THE ATTRIBUTES OF NEW MINE DESIGN CONCEPTS IS THE PRINCIPLE OBJECTIVE OF THE PROPOSED EFFORT.

HUMBUG MOUNTAIN RESEARCH LABS
PO BOX 1380
DUARTE, CA 91010
CONTRACT NUMBER:
DR ALAN A VETTER
TITLE:
SCANNING LASER AIRCRAFT SURVEILLANCE SYSTEM FOR CARRIE OPERATIONS
TOPIC# 208 OFFICE: NAEC/NAVAIR

THE SCANNING LASER AIRCRAFT SURVEILLANCE SYSTEM (SLASS) USES TWO SCANNING LASER BEAMS TO ILLUMINATE APPROACH CORRIDORS AND RETROREFLECTORS LOCATED ON AIRCRAFT LANDING GEARS TO DETERMINE VERY PRECISELY THE AZIMUTHAL, ASCENSION, YAW, ROLL, AND PITCH ANGLES OF

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CARRIER APPROACHING AIRCRAFT. THE RANGE, APPROACH VELOCITY, AND AIRCRAFT TYPE ARE ALSO DETERMINED. THE POSITION OF THE AIRCRAFT IS DETERMINED BY THE TIME FOR THE SCANNING BEAM TO TRAVEL BETWEEN RETROREFLECTORS; OPTICAL RESOLUTION OF THE AIRCRAFT IS NOT REQUIRED. SINCE THE LASER BEAMS ARE INFRARED, LOW POWER, AND HIGHLY DIRECTIONAL, THEY HAVE A VERY LOW PROBABILITY OF SPURIOUS INTERCEPT. THE FEASIBILITY OF THE SLASS, TOGETHER WITH COMPLEMENTARY SENSORS, TO PERFORM AIRCRAFT SURVEILLANCE, AIRCRAFT TRACKING, AIRCRAFT CONFIGURATION, AND AUTOMATIC AIRCRAFT TYPE IDENTIFICATION WILL BE EVALUATED WITH A SYSTEMS APPROACH. THIS EFFORT ALSO INCLUDES TRADE-OFF STUDIES AND QUANTITATIVE ANALYSIS OF CANDIDATE SLASS CONFIGURATIONS AND OPTIONS. THE GOAL OF THIS EFFORT IS TO PROVIDE IMPROVED INFORMATION ON THE APPROACHING AIRCRAFT TO THE LSO AND CATCC TO REDUCE LANDING MISHAPS AND MISSED LANDINGS.

HUMBUG MOUNTAIN RESEARCH LABS
PO BOX 1380
DUARTE, CA 91010
CONTRACT NUMBER:
DR ALAN A VETTER
TITLE:
LASER GLIDESLOPE INDICATOR FOR CARRIER FLIGHT OPERATIO
TOPIC# 209 OFFICE: NAEC/NAVAIR

THE LASER GLIDESLOPE INDICATOR (LGI) USES A SERIES OF LOW POWER, BUT HIGHLY VISIBLE LASER BEAMS TO ILLUMINATE APPROACH CORRIDORS FOR CV AND CVN FLIGHT OPERATIONS. BY TAKING ADVANTAGE OF THE ABILITY TO PRECISELY SHAPE AND DIRECT VISIBLE LASER BEAMS, AND BY ENCODING THE ILLUMINATED PATHS USING COLOR AND TEMPORAL MODULATION, THE PILOT IS PROVIDED WITH DIRECT VISUAL SIGNALS WHICH INDICATE THE GLIDESLOPE. THIS SYSTEM PROVIDES A POSITIVE ON COURSE SIGNAL AND WELL AS THE DIRECTION AND DEGREE OF DEVIATION FROM THE PROPER APPROACH. THE OPTICAL SYSTEM WILL BE ARRANGED SO THAT THE LGI IS VISIBLE FROM 3 MILES OUT AND DISAPPEARS FROM THE PILOTS VIEW AT 0.5 MILES OUT WHERE THE FLOLS IS RESOLVABLE. THE LGI PROVIDES THE PILOT WITH CONSTANT GLIDESLOPE RESOLUTION DURING THE APPROACH. SINCE THE LASERS ARE LOW POWER AND HIGHLY DIRECTIONAL, THEY HAVE A VERY LOW PROBABILITY OF SPURIOUS INTERCEPT. SINCE THE PILOT RECEIVES ALL CUES VISUALLY, THE LGI OPERATES IN THE EMCON ENVIRONMENT. THE FEASIBILITY OF THE LGI

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WILL BE DETERMINED BY DEVELOPMENT OF A BRASSBOARD UNIT AND FIELD TESTING. THIS EFFORT ALSO INCLUDES TRADE-OFF STUDIES RELATED TO THE FEASIBILITY AND DEVELOPMENT OF THE LGI.

HUNTER RESEARCH INC
PO BOX 22737
MELBOURNE, FL 32902
CONTRACT NUMBER:
THOMAS H OTTEN
TITLE:
AUTOMATED BEST SOURCE SELECTOR
TOPIC# 215 OFFICE: PMTC/NAVAIR

THIS PROPOSAL ADDRESSES THE NEED TO PROVIDE AN AUTOMATIC BEST SOURCE SELECTION OR BEST DATA ESTIMATE FOR UP TO SIX SPACE-DIVERSIFIED SOURCES OF TELEMETRY DATA. AN AUTOMATED BEST SOURCE SELECTOR IS PROPOSED WHICH MEETS THE REQUIREMENT WITH THREE OUTPUT MODES; A BEST SOURCE SELECTION, A BEST ESTIMATE VIA MAJORITY VOTING, AND COMBINED MODE WHICH AUTOMATICALLY OUTPUTS THE BEST SOURCE WHEN AT LEAST ONE OF THE SIX SOURCES EXHIBITS A HIGH BER AND A BEST ESTIMATE WHEN ALL SOURCES EXHIBIT A LOW BER. SWITCHOVER BETWEEN SOURCES AND BETWEEN THE BEST SOURCE AND BEST ESTIMATE IS AUTOMATIC WITHOUT PHASE OR TIMING TRANSIENTS WHICH COULD DISTURB RECORDING, PROCESSING, OR DISPALY EQUIPMENTS RECEIVING THE OUTPUT OF THE AUTOMATED BEST SOURCE SELECTOR. KEY FEATURES OF THE DESIGN INCLUDE RATE BUFFERING OF THE DATA SOURCES TO ALLOW FOR DIFFERENTIAL RANGE VARIATIONS AMONG THE RECEIVING STATIONS DURING THE COURSE OF THE MISSILE FLIGHT BEING MONITORED, AND THE ACQUISITION AND MAINTENANCE OF DATA SYNCHRONIZATION AND ANALYSIS TO DETERMINE DESIGN PARAMETERS, A DETAIL DESIGN OF THE UNIT, AND BREADBOARDING TO DEMONSTRATE THE CONCEPT.

INDUSTRIAL QUALITY INC
PO BOX 2397 - 9832 CANAL RD
GAITHERSBURG, MD 20879
CONTRACT NUMBER:
DR Y T CHENG
TITLE:
DEVELOPMENT OF DATA FILE STANDARDS FOR AUTOMATED ULTRA SCANNING SYSTEMS
TOPIC# 102 OFFICE: NAVAIS

SUBMITTED BY

WE PROPOSE TO OBTAIN INFORMATION ABOUT EXISTING AUTOMATED ULTRASONIC SCANNING SYSTEMS WITHIN THE DOD COMMUNITY. THE EMPHASIS WILL BE ON DATA STORAGE AND RETRIEVAL METHODS USED AND WILL INCLUDE INFORMATION ABOUT THE DATA FORMAT AND STORAGE MEDIUM. THE INFORMATION WILL BE TABULATED AS TO DATA RECORD FILE FORMAT AND RETRIEVAL, RECORD MANAGEMENT, PRE AND POST DATA PROCESSING AND THE COMPUTER OPERATING SYSTEM. INFORMATION WILL BE OBTAINED FROM EQUIPMENT MANUFACTURERS, AEROSPACE MANUFACTURERES AND SUBCONTRACTORS AND MILITARY MAINTENANCE FACILITIES SUCH AS THE NARF'S AND ALC'S. THE DATA GATHERING WILL BE AIDED BY THE EXTENSIVE CONTACTS INDUSTRIAL QUALITY, INC. HAS WITHIN THE NONDESTRUCTIVE TESTING (NDT) FIELD. THE DATA WILL BE ANALYZED AND RECOMMENDATIONS MADE FOR SOFTWARE/HARDWARE METHODS TO ALLOW INTERCHANGE OF ULTRASONIC DATA. CONSIDERATION WILL ALSO BE GIVEN TO INTERCHANGE OF OTHER NDT DIGITAL DATA, SUCH AS THAT FROM REAL-TIME RADIOGRAPHY. CAD/CAM FORMATS AND A NEW FEDERAL STANDARD FOR INFORMATION INTERCHANGE ARE AMONG THE CONCEPTS TO BE CONSIDERED. CONCEPTS FOR A PROCUREMENT SPECIFICATION TO ALLOW DATA INTERCHANGE WILL BE DEVELOPED.

INFORMATION SYSTEMS LABS
6870 ELM ST - STE 300
McLEAN, VA 22101
CONTRACT NUMBER:
JOHN E DON CARLOS
TITLE:
SUBMARINE COMMUNICATION IN DIRECT SUPPORT OF A BATTLE
TOPIC# 34 OFFICE: SPAWAR

ATTACK SUBMARINE EFFECTIVENESS IN THE BATTLE GROUP IS HAMPERED BY LACK OF A RELIABLE MEANS OF COMMUNICATION WITH OTHER ELEMENTS OF THE BATTLE GROUP WHICH DOESN'T COMPROMISE THE SUBMARINE'S STEALTH OR MANEUVERABILITY. PRINCIPLE TECHNICAL CHALLENGES ARE PROPAGATION THROUGH A HIGHLY CONDUCTING MEDIUM, (SEAWATER) AND MINIMIZING THE PROBABILITY OF INTERCEPT AND POSITION FIXING OF THE RADIATED SIGNAL. ISL PROPOSES INNOVATIVE TECHNIQUES AND SYSTEMS CONCEPTS COUPLED WITH TECHNOLOGIES, REQUIREMENTS ANALYSIS, QUANTITATIVE EVALUATION OF A ALTERNATIVE AND SYSTEM DEFINITION.

INTEGRATED SOFTWARE INC
BOX 060295
PALM BAY, FL 32906
CONTRACT NUMBER:
DR SAMUEL S HARBAUGH
TITLE:
IMPLEMENTATION OF ADA ON DISTRIBUTED MICROPROCESSOR CO
ARCHITECTURES FOR AIRCREW TRAINING SYSTEMS
TOPIC# 218 OFFICE: NTSC/NAVAIR

SUBMITTED BY

THE PROPOSED PROJECT WILL DEVELOP A PLAN FOR IMPLEMENTING AND EVALUATING ADA AS THE SOFTWARE LANGUAGE ON MAJOR TRAINING SYSTEMS ACQUISITIONS WHICH INCORPORATE DISTRIBUTED MICROPROCESSORS AS THE SIMULATION SYSTEM. MANY IMPLEMENTATION ISSUES HAVE BEEN DEFINED FOR SINGLE MICROPROCESSOR REAL-TIME SYSTEMS PROGRAMMED IN ADA AND SOME SOLUTIONS ARE BEING DEVELOPED. HOWEVER SIMILAR DEFINITIONS AND SOLUTIONS ARE NOT AVAILABLE FOR DISTRIBUTED MICROPROCESSOR SYSTEMS. THE PROPOSED PROJECT WILL DEFINE THE REQUIREMENTS OF SOFTWARE IN DISTRIBUTED MICROPROCESSOR REAL-TIME SIMULATION SYSTEMS AND DETERMINE WHICH OF THESE CAN AND CANNOT BE MET WITH AVAILABLE ADA IMPLEMENTATIONS. THE ADVANTAGES/DISADVANTAGES TO IMPLEMENTATION IN ADA WILL BE EVALUATED. ALTERNATIVE ADA IMPLEMENTATION APPROACHES WILL BE DEVELOPED. THE ALTERNATIVES WHICH LIE ALONG THE CRITICAL PATH FOR USE OF ADA WILL BE IDENTIFIED AS DEVELOPMENT ISSUES FOR PHASE II.

INTELLIGENT SYSTEMS DESIGNS INC
15400 SE 30TH PL - NCR CENTER/STE 101
BELLEVUE, WA 98007
CONTRACT NUMBER:
RICHARD P JONES
TITLE:
DEVELOPMENT OF INEXPENSIVE VCR TRAINING THROUGH DIGITA PROCESSING AND VIDEO DATA BASE CONSTRUCTION
TOPIC# 150 OFFICE: NSWC

BY COMBINING THE POWER OF RECENT ADVANCES IN VIDEO AND MICROCOMPUTER TECHNOLOGIES ALONG WITH RECENTLY COMPLETED INTERACTIVE WINDOWING SOFTWARE, ANIMATION-GRAPHICS SOSTWARE, AND THE NEW VIDEO GRAPHICS BOARDS THE ABILITY TO DIGITIZE RAW VIDEO TAPE SHOWING PERFORMANCE OF COMPLEX JOB TASKS AND THE PROCESSING OF THE VIDEO IMAGES INTO TRAINING AND INFORMATION MODULES IS NOW POSSIBLE. THE POWER OF THESE NEW TECHNOLOGIES WILL PROVIDE A SUBSTANTIAL SAVINGS ON THE DEVELOPMENT OF NEW TRAINING MODULES SINCE PROFESSIONAL TV/FILM CREWS AND PRODUCTION STAFFS WILL NOT BE REQUIRED.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER:
DR WILLIAM GRAHAM
TITLE:
NEAR FIELD OCEAN ACOUSTIC IMAGING WITH A LINEAR ARRAY
TOPIC# 22 OFFICE: ONT

SUBMITTED BY

THIS PROPOSAL IS ADDRESSED TO THE ASW PROBLEM OF INCREASING PROBABILITY OF DETECTION AND TARGET LOCALIZATION IN LONG RANGE SURVEILLANCE USING A PASSIVE UNDERWATER ACOUSTIC ARRAY. THE INNOVATIVE CONCEPT PROPOSED IS HIGH SPEED, HIGH RESOLUTION OCEAN ACOUSTIC IMAGING IN TWO DIMENSIONS (RANGE AND AZIMUTH). THE TECHNIQUE PROPOSED TO ACCOMPLISH THIS IS THE USE OF A VERY LONG, FIXED, HORIZONTAL LINE ARRAY (VERY LARGE ARRAY OR VLA) FOCUSED IN THE NEAR FIELD, AND USING ORIGINAL METHODS OF HIGH SPEED NEAR FIELD DIGITAL BEAMFORMING, AND TWO DIMENSIONAL NEAR FIELD PATTERN SYNTHESIS TO ACHIEVE VERY LOW SIDE-LEVELS. THE CONCEPT HAS THE POTENTIAL OF PROVIDING A SOLUTION TO MANY OF THE PROBLEMS IN SUBMARINE DETECTION WHICH ARE DISCUSSED IN THE PROPOSAL.

INTERSPEC INC
1100 E HECTOR ST
CONSHOHOCKEN, PA 19428
CONTRACT NUMBER:
DR WILLIAM J GRAHAM
TITLE:
INTERNALLY FOCUSED RANDOM ARRAYS
TOPIC# 188 OFFICE: NADC/ONT

A CONCEPT IS PROPOSED FOR NEAR-FIELD FOCUSING AND SCANNING WITH A RANDOM DISTRIBUTED ACOUSTIC ARRAY FOR LONG RANGE SURVEILLANCE. THE ARRAY MAY BE SEVERAL MILES IN DIAMETER AND FOCUSED WITHIN OR OUTSIDE ITS OWN BOUNDARIED PROVIDING IMPROVED TARGET LOCALIZATION IN BOTH RANGE AND AZIMUTH AND REJECTING INTERFERING NOISE SOURCES WITH ITS HIGH RESOLUTION TWO-DIMENSIONAL FOCUS. THE PROPERTIES OF FOCUSED RANDOM ARRAYS ARE DISCUSSED IN DETAIL INCLUDING RESOLUTION, NUMBER OF BEAMS REQUIRED FOR COVERAGE, BANDWIDTH, SIDELOBE LEVEL, AND MAIN BEAM INTERFERENCE REJECTION. INNOVATIVE TECHNIQUES ARE PROPOSED FOR REDUCTION OF THE INHERENTLY HIGH SIDELOABES OF THE FOCUSED RANDOM ARRAY WHICH HAVE THE POTENTIAL OF ACHIEVING HIGH PERFORMANCE WITH A FEASIBLE PROCESSING LOAD. THE FACTORS WHICH INFLUENCE ARRAY CONFIGURATION ARE DISCUSSED AND METHODS ARE PROPOSED FOR DEVELOPING SUCH CONFIGURATIONS TO PROVIDE COVERAGE OF A LARGE AREA WITH AN ACCEPTABLE NUMBER OF BEAMS AND SUFFICIENT ARRAY GAIN. THE EFFECTS ON PROCESSING LOAD ARE ALSO EXAMINED.

J&D SCIENTIFIC INC
2854 SOUTHAVEN DR
ANNAPOLIS, MD 21401
CONTRACT NUMBER:
LARRY D McCORMICK
TITLE:
IN SITU SCANNING TUNNELING MICROSCOPY OF ALUMINUM META COMPOSITES
TOPIC# 155 OFFICE: NSWC

SUBMITTED BY

SCANNING TUNNELING MICROSCOPY HAS DEMONSTRATED THE ABILITY TO IMAGE SURFACES IN A VACUUM, AIR, AND SOLUTION AT THE ATOMIC LEVEL. THE TECHNIQUE HAS ALSO BEEN APPLIED TO POLYCRYSTALLINE MATERIALS, THE REGIONS NEAR GRAIN BOUNDARIES, ATOMIC DEFECTS, AND THEIR RESPECTIVE LOCALIZED SPECTROSCOPIES. THE LOCALIZED CORROSION OF ALUMINUM ALLOYS IN SEA WATER IS A WELL-STUDIED BUT STILL NOT UNDERSTOOD PROBLEM. THE LOCALIZED CORROSION OF ALUMINUM METAL MATRIX COMPOSITES (MMC) HAS BEEN STUDIED AND HAS SHOWN THAT THESE MATERIALS ARE SUSCEPTIBLE TO PITTING. THIS PROPOSED RESEARCH WILL BE AN ATTEMPT TO STUDY THE PITTING OF ALUMINUM MMC's AT THE ATOMIC LEVEL WITH SCANNING TUNNELING MICROSCOPY.

KAPTRON INC
3460 W BAYSHORE RD
PALO ALTO, CA 94303
CONTRACT NUMBER:
DR FRED UNTERLEITNER
TITLE:
AUTOMATION OF FIBER-OPTIC PIGTAILING PROCESS
TOPIC# 51 OFFICE: NAVSEA

PRODUCTION TECHNIQUES FOR FIBER PIGTAILED SEMICONDUCTOR LASERS ARE ENTIRELY MANUAL AT THIS TIME. AUTOMATION OF THE PROCESSES WILL BECOME INCREASINGLY IMPORTANT AS FIBER OPTICS BECOMES MORE WIDELY USED, NECESSITATING HIGH VOLUME, LOW COST PRODUCTION METHODS. TWO TECHNIQUES IN USE TODAY, MANUAL SOLDERING AND MANUAL EPOXYING OF THE FIBER TO A SUBSTRATE IN THE PACKAGE, HAVE PROVEN UNWIELDLY IN TERMS OF VOLUME CAPABILITY AND LONG-TERM RELIABILITY. THIS PHASE I PROPOSAL WILL EXPLORE THE POSSIBILITY OF USING LASER INDUCED WELDING TO ACHIEVE AN IMMEDIATE AND PERMANENT BOND WITHOUT THE TEMPERATURE PROBLEMS OF SOLDER AND HERMETICITY PROBLEMS TO EPOXY. A LASER BONDING SYSTEM WILL BE INTEGRATED WITH THE KAPTRON "POLYTROPE 1000" COMPUTER-CONTROLLED AUTOMATIC ALIGNMENT AND TEST INSTRUMENT. THE PROVEN EFFICIENCY AND STABILITY OF THE COUPLING OF THE LASER ENERGY INTO THE FIBER, AS WELL AS A PROTOTYPE AUTOMATIC ALIGNMENT AND LASER WELDING SYSTEM, ARE THE PRIMARY PROGRAM OBJECTIVES.

KINTON INC
5707 SEMINARY RD
BAILEY'S CROSSROA, VA 22041
CONTRACT NUMBER:
DR EDGAR L SHRIVER
TITLE:
DEVELOPMENT OF A FUNCTIONAL-WORK-CONTEXT COURSE IN BAS
TOPIC# 221 OFFICE: NPRDC/ONT

SUBMITTED BY

TRAINING FOR MILITARY TECHNICIANS USUALLY BEGINS WITH AN ACADEMIC DISCOURSE ON THE BASIC CONCEPTS AND PHYSICAL LAWS OF ELECTRICITY. AN ALTERNATIVE TO THIS METHOD IS THE FUNCTIONAL-WORK-CONTEXT (FWC) APPROACH THAT CREATES AN INTERACTIVE WORK-LIKE SETTING FOR LEARNING. KINTON WILL DEVELOP AND PRODUCE AN FWC COURSE IN BASIC ELECTRICITY AND ASSESS THE QUALITY OF LEARNING ACHIEVED BY STUDENTS. THE OBJECTIVES OF THE DELIVERABLE WILL BE: 1) TO COMPARE FWC STUDENT PERFORMANCE TO THAT OF STUDENTS LEARNING ONLY WITH STANDARD COURSE MATERIALS; 2) TO ENSURE THAT THE TIME REQUIRED BY STUDENTS TO LEARN IS NO MORE THAN 60 HOURS; AND 3) TO ASCERTAIN THROUGH STUDENT FEEDBACK HOW MUCH THEY WERE MOTIVATED BY THE MATERIAL, HOW MUCH THEY ENJOYED IT, AND HOW MUCH THEY UNDERSTOOD IT. THE FWC APPROACH IS A COMBINATION AND UPDATE OF ELEMENTS FROM TRAINING RESEARCH STUDIES CONDUCTED OVER THE PAST 30 YEARS. NEW HARDWARE TECHNOLOGY HAS LOWERED THE COSTS OF CERTAIN ELEMENTS OF OLD STUDIES SO THAT WHAT WAS THEN EFFECTIVE IS NOW COST EFFECTIVE. FORMER RESEARCH TECHNIQUES HAVE BEEN UPDATED TO MODERN TECHNOLOGY WHILE RETAINING THOSE CONCEPTS AND APPROACHES THAT MADE THE HISTORICAL RESEARCH EFFECTIVE IN IMPROVING PERFORMANCE.

KMS FUSION INC
PO BOX 1567 - 3853 RESEARCH PK
ANN ARBOR, MI 48106
CONTRACT NUMBER:
JAMES G DOWNWARD
TITLE:
ADVANCED DIGITAL FRINGE ANALYSIS WORKSTATION
TOPIC# 138 OFFICE: NSWC

LASER HOLOGRAPHIC INTERFEROMETRY HAS BECOME AN IMPORTANT TOOL FOR AERODYNAMIC RESEARCH BECAUSE INTERFEROGRAMS PROVIDE QUANTITATIVE MEASUREMENTS OF THE FLOWFIELD SURROUNDING WIND TUNNEL MODELS. HOWEVER, UNTIL RECENTLY, ROUTINE USE OF HOLOGRAPHIC INTERFEROMETRY HAS BEEN IMPRACTICAL BECAUSE ANALYZING FRINGE DATA IS AN EXTREMELY LABORIOUS PROCESS. KMS IS NOW DEVELOPING A MODULAR FRINGE ANALYSIS SYSTEM WHICH WILL PROVIDE A FLEXIBLE RESEARCH TOOL FOR AUTOMATING THE ANALYSIS OF FRINGE DATA. HOWEVER, KMS'S CURRENT EFFORT STILL DOES NOT ADDRESS A NUMBER OF KEY TECHNICAL ISSUES, NAMELY; PROVIDING A TRULY USER-FRIENDLY OPERATOR INTERFACE, PROVIDING THE CAPABILITY FOR ANALYZING HIGH RESOLUTION FRINGE IMAGE DATA, AND PROVIDING FAST

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ANALYSIS OF A SERIES OF IMAGES. TO ADDRESS THESE ISSUES, KMS PROPOSES FURTHER WORK TO DEVELOP AN ADVANCED FRINGE ANALYSIS WORKSTATION WITH A HUMAN-ENGINEERED, OPERATOR'S INTERFACE WHICH CAN EXTRACT FRINGE CONTOURS FROM CLOSELY SPACED FRINGES. THE WORKSTATION WOULD HAVE IMPROVED ABIITY TO DISTINGUISH FRINGE DATA FROM BACKGROUND ARTIFACTS AND NOISE AS WELL AS SIGNIFICANTLY IMPROVED PERFORMANCE. DURING THE PHASE I EFFORT, KMS WILL DEVELOP THE FUNCTIONAL DESIGN SPECIFICATION FOR IMPLEMENTING THE ADVANCED FRINGE ANALYSIS WORKSTATION.

KONIGSBERG INSTRUMENTS INC
2000 FOOTHILL BLVD
PASADENA, CA 91107
CONTRACT NUMBER: NOO600-88-C-0615
TIM CUSHING
TITLE:
DISPERSED TELEMETRY SYSTEM FOR MEASUREMENT OF BODY TEM
TOPIC# 94 OFFICE: NAVSUP

WE ARE FUNDED BY A JOINT ARMY-NAVY-AIR FORCE PROGRAM TO DEVELOP AND PRODUCE AN INGESTIBLE, DISPOSABLE TEMPERATURE TELEMETRY PILL, A COMPUTER-CONTROLLED RECEIVER AND RETRANSMITTER, A SEPARATE-COMPUTER CONTROLLED SIX-CHANNEL DATA ACQUISITION SYSTEM (ECG, SURFACE TEMPERATURE, ACTIVITY, ETC.), AND A SEPARATE COMPUTER TO ANALYZE INPUT DATA TO DETERMINE INCIPENT LOSS OF THERMOREGULATION AND WARN BEARER, COHORTS, AND BASE OF IMMINENT DANGER. THIS 0.5 LITER VOLUME INTERCATIVE SYSTEM CAN BE USED FOR THIS APPLICATION, REGARDING PACKAGING MODIFICATIONS FOR HYPERBARIC APPLICATION, HYDROPHONE INTERFACE, SALINE SONIC TRANSMISSION CHARACTERISTICS, AND LIKE CONCERNS. PROTOTYPE RECEIVERS AND PILLS HAVE BEEN BUILT AND TESTED. WE PROPOSE TO EXTEND THIS TECHNOLOGY SO THAT ALL TEMPERATURE SENSORS ARE COUPLED TO MINIATURE TRANSMITTERS, FREEING THE DIVER FROM ENCUMBERING INSTRUMENTATION HARNESSES, AND FREEING PHYSIOLOGICAL EXPERIMENTS OF THE NEED TO CHANGE HARNESSES TO SUIT DIFFERENT PHYSIQUES AND CHANGING EXPERIMENTAL DESIGNS. WE PROPOSE DELIVERABLE HARDWARE (PILLS, TRANSCEIVERS, BASE STATION) USED IN A NEAR SUFACE SALINE ENVIRONMENT OR AIR. WE SHALL PROGRAM THE RECEIVER TO MONITOR MULTIPLE TRANSMITTERS AND RELAY THE DATA. WE SHALL TEST INTRA-SYSTEM RF PROPAGATION IN THE SALINE AND ON SHIPBOARD, AND STUDY OTHER SYSTEM INTER-

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CATIONS (HYDROPHONE, DISPLAY, ETC.). A MULTIPARAMETER PHYSIOLOGICAL MONITORING SYSTEM FREE FROM THE NEED OF CABLE HOOKUPS WOULD BE MORE COMFORTABLE, LESS HAMPERING, AND SAFER. SUCH A SYSTEM WOULD SIMPLIFY INSTALLATION OF A VARIETY OF SENSOR TYPES, ON DIFFERENT PHYSIQUES AND SITES. THE SMALL SIZE OF INDIVIDUAL TRANSMITTERS AND THE MASTER RECEIVER WOULD MAKE DATA ACQUISITION FEASIBLE IN A LOW-TECH ENVIRONMENT (FIRE-FIGHTERS, CHEMICAL SPILL WORKERS, ATHLETES, ORTHOPEDIC REHABILITATION) AS WELL AS FOR DIVERS.

KRAUSE P C & ASSOCS INC
1414 RAVINIA RD
WEST LAFAYETTE, IN 47906
CONTRACT NUMBER:
PAUL C KRAUSE
TITLE:
MODELING OF SHIPBOARD ELECTRIC POWER DISTRIBUTION SYST
TOPIC# 14 OFFICE: ONT/DTRC

THE CONTINUOUS ADVANCEMENT IN COMPUTERS AND PROGRAMMING METHODS COUPLED WITH EXPANDING MODELING TECHNIQUES OFFER THE REAL POSSIBILITY OF DEVELOPING A DETAILED COMPUTER SIMULATION OF SHIPBOARD POWER SYSTEMS. EXPLORING THIS POSSIBILITY IS THE SUBJECT OF THIS PROPOSAL. THIS WILL BE ACCOMPLISHED BY ESTABLISHING THE MODELING REQUIREMENTS IN REGARD TO THE DETAIL NECESSARY, THE FORM OF THE COMPONENT MODELS, TECHNIQUES FOR INTERCONNECTING THE COMPONENT MODELS TO PROVIDE A COMPLETE SYSTEM SIMULATION, AND TO PROVIDE A SIMULATION OF AN EXAMPLE SYSTEM FOR EVALUATION. THE SIMULATION OF AN EXAMPLE SYSTEM, TO BE MUTUALLY DECIDED UPON WITH THE NAVY, WILL BE THE PRIMARY DELIVERABLE OF PHASE I. IF THIS SIMULATION MEETS WITH THE APPROVAL OF THE NAVY, THE STAGE WILL BE SET FOR PHASE II. IF A FLEXIBLE, ACCURATE COMPUTER SIMULATION CAN BE DEVELOPED IN PHASE II, IT WOULD PROVIDE AN INVALUABLE TOOL; AN ECONOMICAL MEANS OF INVESTIGATING PROBLEMS AND/OR DESIGN CHANGES OF EXISTING SYSTEMS, AND A TOOL FOR ESTABLISHING THE CONFIGURATION AND CONTROL OF FUTURE SHIPBOARD POWER SYSTEMS.

KRUTH MICROWAVE/ELECTRONICS CO (KMEC)
2600 CABOVER DR - STE H
HANOVER, MD 21076
CONTRACT NUMBER:
JEFFREY A KRUTH
TITLE:
LOW COST MMW ROBOT RADAR SYSTEMS
TOPIC# 84 OFFICE: NAVSEA

SUBMITTED BY

THE PROBLEMS ASSOCIATED WITH BATTLEFIELD ROBOT SENSOR TECHNOLOGY ARE DISCUSSED. UTILIZATION OF MILLIMETER WAVE RADAR AS A POSSIBLE SOLUTION IS PROPOSED. AN INNOVATIVE RADAR DESIGN BASED ON FREQUENCY MODULATED (FM) TECHNIQUES IN LIEU OF PULSED OPERATION IS THE BASIS OF THE PHASE I STUDY. THE USE OF A DEDICATED MICROPROCESSOR FOR RADAR SYSTEM CONTROL AND FAST FOURIER TRANSFORM (FFT) SIGNAL PROCESSING IMPLEMENTATION IS PROPOSED. ADAPTION OF PREVIOUSLY DEVELOPED LOW COST RF COMPONENTS USED IN SEEKER APPLICATIONS IS PART OF THE TECHNICAL APPROACH. OTHER KEY POINTS OF THE RF DESIGN ARE ANTENNA CONSIDERATIONS, USE OF SOFT-SUBSTRATE AND FINLINE TECHNOLOGY, APPLICATION OF VARACTORS TO SUBSTITUTE BULKY YIG COMPONENTS, AND USE OF EFFICIENT INDIUM PHOSPHIDE GUNN DIODES FOR POWER GENERATION. ANALYSIS BASED ON CUSTOMER GOALS WILL BE PERFORMED. A RADAR MODEL WILL BE PROGRAMMED TO ALLOW RAPID TRADE-OFF OF KEY SYSTEM DESIGN PARAMETERS. A PREVIOUSLY DEVELOPED RF CHAIN CALCULATION PROGRAM WILL BE USED TO ALLOW RF DESIGNS TO BE OPTIMIZED. ANTENNA TECHNIQUES WILL BE BASED ON A QUASI-MONOPULSE FEED SYSTEM FOR SIMULTANEOUS ELEVATION SCANNING. A BREADBOARD FOR OPERATION AT 35 GHz IS CONSIDERED.

L.N.K. CORP INC
6811 KENILWORTH AVE - STE 306
RIVERDALE, MD 20737
CONTRACT NUMBER:
BARBARA D LAMBIRD
TITLE:
REAL TIME 3-D COMPUTER VISION
TOPIC# 147 OFFICE: NSWC

THE ROBOTIC LABORATORY AT NSWC IS CURRENTLY USING A VISION SYSTEM WHICH DIFFERS SIGNIFICANTLY FROM THOSE FOR WHICH MOST 3-D OBJECT RECOGNITION ALGORITHMS WERE DESIGNED. AS A RESULT, THE IMAGING SYSTEM PRESENTS A UNIQUE PROBLEM IN OBJECT RECOGNITION. LNK PROPOSES TO DEVELOP ALGORITHMS FOR THE RECOGNITION OF OBJECTS USING THE IMAGES SLICES RETURNED BY THE IMAGING SYSTEM AND/OR ORIGINAL GRAY LEVEL IMAGES. THE BASIC ALGORITHMS DEVELOPED WILL BE EXTENDABLE TO THE HANDLING OF MANY COMPLEX OBJECTS. THE DESIGNED ALGORITHMS WILL PRESENT APPROACHES TO UNDERTAKE THE DIFFICULT TASK OF SOLVING THE UNIQUE PROBLEMS THAT ARISE OUT OF THE UNCERTAINTY IN DEPTH PERCEPTION GENERATED BY THE NSWC IMAGING SYSTEM.

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LARGO SCIENTIFIC INC
3104 ROBERTA ST
LARGO, FL 33541
CONTRACT NUMBER:
DR RICHARD K SPEARS
TITLE:
METALLIC MATERIAL TESTING TECHNIQUE CORRELATION OR CHA
IMPACT ENERGY CORRELATION
TOPIC# 178 OFFICE: NWC/SSPO

THE PROJECT PROPOSES THAT THE PHASE I EFFORT CONCENTRATE ON DETERMINING IMPACT DIFFERENCES BETWEEN THE CHARPY AND THE IZOD SPECIMEN WHILE EXAMINING THE CHEMISTRY, MICROSTRUCTURE AND PROPERTIES OF THESE STEEL. WE ALSO INTEND TO EXTEND THIS TO INCLUDE FINITE ELEMENT ANALYSIS OF THE SPECIMENS. THE PRECISE MATERIAL TO BE TESTED WILL BE DETERMINED FROM THE PROJECT MANAGER. THE FINITE ELEMENT STRUCTURAL ANALYSIS IS AN ANALYTICAL METHOD WHERE THE STATE OF STRESS CAN BE DETERMINED WITHIN A STRUCTURE BY DIVIDING THE STRUCTURE INTO SMALL ELEMENTS AND EXAMINING THE MINIMUM ENERGY WHEN THE STRUCTURE IS STRESSED. CHEMISTRY, CHARACTERISTICS OF THE FRACTURE SURFACT, MICROSTRUCTURE AND MECHANICAL PROPERTIES ARE ALSO TO BE DETERMINED. IN PHASE II IT IS RECOMMENDED THAT PRE-CRACKED SPECIMENS BE EXAMINED.

LASER POWER OPTICS
12777 HIGH BLUFF DR
SAN DIEGO, CA 92130
CONTRACT NUMBER: N60530-88-C-0130
PHILIP C BAKER
TITLE:
FRACTURE ANALYSIS OF ZnSe AND ZnS FOR REDUCTION OF SUB
DAMAGE
TOPIC# 172 OFFICE: NWC/NAVAIR

CONVENTIONAL PROCESSING OF POLYCRYSTALLINE MATERIALS THAT HAVE BEEN GROWN USING CVD METHODS IS NOT WELL UNDERSTOOD IN TERMS OF THE SUBSURFACE DAMAGE CAUSED BY THE FABRICATION PROCESSING. THE CRYSTAL STRUCTURE OF THE ZnSe AND THE ZnS, WHEN CVD IS USED, HAS AT LEAST

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TWO CRYSTAL ORIENTATIONS THAT ARE OF DIFFERENT HARDNESSES AND REACT DIFFERENTLY TO THE FORCES DURING MANUFACTURING. THIS STUDY WILL UTILIZE PAST EXPERIENCE IN THE AREA OF SUB-SURFACE DAMAGE STUDIES TO DETERMINE THE LEVEL OF THE CRACK PROPAGATION IN THE CVD MATERIALS. STUDIES CONDUCTED ON GLASSY AND CRYSTALLINE MATERIALS HAVE REVEALED A GREAT DEAL ABOUT THE NATURE OF THE RESIDUAL DAMAGE IN BRITTLE SOLIDS. THIS EFFORT WILL INCORPORATE THE METHODS USED BY THE PREVIOUS STUDIES TO PROVIDE THE DATA NECESSARY IN DETERMINING THE STRUCTURE AND SUBSTRUCTURES OF ZnSe AND ZnS.

LASER SCIENCE INC
80 PROSPECT ST
CAMBRIDGE, MA 02139
CONTRACT NUMBER:
DR ALI JAVAN
TITLE:
FREQUENCY STABILIZATION IN PULSED LASER WAVEFORMS
TOPIC# 30 OFFICE: SPAWAR

A DESIGN PHASE PROGRAM IS PROPOSED FOR THE DEVELOPMENT OF A PROCESS AND EQUIPMENT FOR USE IN FREQUENCY CONTROL OF PULSED LASERS TO ACHIEVE VERY HIGH FREQUENCY STABILITY (1 IN 10 TO THE 10TH POWER OR 10 TO THE 11TH POWER). THERE EXISTS A VARIETY OF IMPORTANT LASER RADAR APPLICATIONS FOR WHICH ENERGETIC LASER PULSES ARE NEEDED AT A FREQUENCY STABILITY AT THIS LEVEL. THE EXISTING METHOD TO ACHIEVE SUCH HIGH STABILITY CONSISTS OF A MOPA CONFIGURATION IN WHICH THE OUTPUT OF A STABLE CW LASER IS AMPLIFIED IN A LARGE PULSED POWER AMPLIFIER BANK. THIS APPROACH SUFFERS FROM TWO MAJOR DRAWBACKS: LARGE SIZE AND INABILITY TO RETAIN THE FREQUENCY STABILITY IN THE PRESENCE OF THE INTENSE ACOUSTICS AND MICROPHONICS ENVIRONMENT IN AN AIRCRAFT. LSI'S PROPOSED "V"-PROCESSOR FOR PULSED LASER FREQUENCY CONTROL IS BASED ON AN ADAPTIVE PROCESS. THE "V"-PROCESSOR SENSES THE FLUCTATIONS OF AN INCIDENT LASER PULSE AT ITS INPUT REFERENCED AGAINST A STABLE OPTICAL CLOCK. THE PROCESSOR REMOVES THE FLUCTUATIONS FROM THE SAME PULSE ELECTRO-OPTICALLY AT A DELAYED TIME. IT ALSO ANCHORS THE PULSE FREQUENCY AT THE CLOCK FREQUENCY. THE PROPOSED DESIGN-PHASE WILL FORMULATE A HARDWARE DEVELOPMENT PROGRAM TO BE IMPLEMENTED IN PHASE II. THE HARDWARE DEVELOPMENT WILL INCLUDE A COMPLETE "V"-PROCESSOR.

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LASER TECHNOLOGY INC
1055 W GERMANTOWN PIKE
NORRISTOWN, PA 19403
CONTRACT NUMBER:
JOHN W NEWMAN
TITLE:
RELIABILITY TESTING OF SEALED ELECTRONICS COMPONENT PA
LASER SPECKLE CORRELATION
TOPIC# 111 OFFICE: NAVAIR/SC

ELECTRONIC CIRCUITS ARE OFTEN PACKAGED IN HERMETICALLY SEALED METAL CANS WITH WELDED OR SOLDERED LIDS. DUE TO THE SUSCEPTIBILITY OF THE CIRCUITS AND THE WIRE INTERCONNECTS TO MOISTURE AND WATER VAPOR, THE PACKAGES MUST BE LEAK-FREE TO A PREDETERMINED LEAK RATE. HIGH RELIABILITY CIRCUITS ARE LEAK TESTED TO MIL SPEC 883-C. THESE METHODS EMPLOY HELIUM AND KRYPTON-85 AS TRACER GASES AND REQUIRE EXTENSIVE BOMBING. A PROPOSED METHOD A LEAK TESTING EMPLOYING LASER SPECKLE CORRELATION COULD REPLACE OR BE A COMPLIMENT TO PRESENT METHODS. THIS NEW TECHNIQUE IS FAST, ALL-ELECTRONIC AND WILL TEST ASSEMBLED CIRCUIT BOARDS. THE TECHNIQUE PROVIDES COMPLETE TRACEAILITY BETWEEN THE TEST PARTS AND THE TEST DATA. LASER SPECKLE CORRELATION PROMISES CONSIDERABLE COST SAVINGS AND INCREASES IN RELIABILITY AND THROUGHPUT AT MANY POINTS THROUGHOUT THE PRODUCTION OF MICROCIRCUITS.

LJF CORP
411 S LONDON AVE
EGG HARBOR, NJ 08215
CONTRACT NUMBER:
JAMES L FOY
TITLE:
INFRARED TARGET SOURCE FOR MISSILE TEST AND EVALUATION
TOPIC# 214 OFFICE: PMTC/NAVAIR

THIS IS A DEVICE FOR TESTING AND EVALUATING ADVANCED INFRARED MISSILE SEEKERS. A VIDEO-TO-PHOTON CONVERTER THAT OPERATES IN THE MID- TO THE FAR INFRA-RED SPECTRUM, IT IS A CATHODE RAY TUBE-LIKE DEVICE WITH A SPECIAL TARGET SUBSTRATE THAT HAS THE CAPABILITY OF EMISSIONS

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IN ALL OF THE WAVEBANDS OF INTEREST. A MEANS TO VARY THE SPECTRAL RESPONSE IS PROVIDED. DELTA T'S OF OVER ONE THOUSAND DEGREES C WITH BACKGROUND TEMPERATURES CONTROLLABLE FROM 20K TO HUNDREDS OF DEGREES K ARE POSSIBLE. RESOLUTION IS COMPARABLE TO THAT OF HIGH RESOLUTION VIDEO MONITORS. A MEANS TO COUPLE TO THE MISSILE WITHOUT INTERFERENCE TO THE MISSILE'S RADAR SYSTEM IS INCORPORATED.

LME (DELTA TECHNOLOGY SYSTEMS)
605 LOUIS DR - STE 503B
WARMINSTER, PA 18974
CONTRACT NUMBER:
W BARRY SHOPE
TITLE:
GENERIC DESIGN OF AN EMERGENCY RECOVERY AND ESCAPE PAT SUBSYSTEM FOR ROTARY WING VEHICLES
TOPIC# 189 OFFICE: NADC/NAVAIR

INFLIGHT RECOVERY OR ESCAPE FROM A DISABLE HELICOPTER REQUIRES THAT THE ROTOR BLADES NOT INTERFERE WITH THE ORDERLY OPERATION OF THE EMERGENCY SYSTEM THAT WILL RETURN THE OCCUPANTS SAFELY TO EARTH. THE OBJECTIVE IS TO PRESENT A METHODOLOGY FOR REMOVAL OF THE ROTOR BLADES IN A CONTROLLED MANNER TO ELIMINATE THEIR BECOMING A FLYING HAZARD TO OTHER AIRCRAFT IN CLOSE PROXIMITY. THIS REPORT PRESENTS A GENERIC DESIGN FOR BOTH BLADE REMOVAL AND DECELERATION TO DELETHALIZE THEIR DANGER AS FREE FLYING MISSILES. STARTING FROM A TRADE-OFF STUDY OF CANDIDATE CONCEPTS WHICH TAKES INTO ACCOUNT COMPLEXITY, COST, RELIABILITY, MAINTENANCE, AND SYSTEM SAFETY FACTORS, A GENERIC DESIGN IS PROPOSED FOR ACCOMPLISHING THE OBJECTIVE.

M.L. ENERGIA INC
PO BOX 1468
PRINCETON, NJ 08542
CONTRACT NUMBER:
DR MOSHE LAVID
TITLE:
RADIATIVE IGNITION AND COMBUSTION ENHANCEMENT FOR NAVY PROPULSION SYSTEMS
TOPIC# 230 OFFICE: NAPC/NAVAIR

SUBMITTED BY

SUCCESSFUL OPERATION OF FUTURE NAVY AIRCRAFT PROPULSION SYSTEMS DEPENDS ON THE ATTAINMENT OF SIGNIFICANT ADVANCES IN COMBUSTION TECHNOLOGY. THE CONDITION OF HIGH FLIGHT-SPEED IMPOSES SEVERE STRAINS ON IGNITION RELIABILITY, FLAMEHOLDING, AND OVERALL COMBUSTION EFFICIENCY. A NOVEL RADIATIVE TECHNIQUE TO ALLEVIATE THESE PROBLEMS IS PROPOSED. THE IDEA IS TO SELECTIVELY IRRADIATE COMBUSTION SPECIES. THE ENSUING PHOTO DISSOCIATIVE REACTIONS GENERATE HIGHLY REACTIVE RADICALS WHICH MODIFY THE GAS PHASE KINETICS AND LEAD TO IGNITION AND ENHANCEMENT VIA CHAIN-BRANCHING PATHS. THE OVERALL OBJECTIVE OF PHASE IS TO EXPERIMENTALLY DETERMINE THE FEASIBILITY OF USING THE RADIATIVE TECHNIQUE TO OBTAIN RELIABLE IGNITION OF JET FUELS UNDER FLOW CONDITIONS. SPECIFIC TASKS IN THIS EFFORT INCLUDE INVESTIGATING MINIMUM IGNITION ENERGY, POWER REQUIREMENTS, FLOW CONDITIONS, RADIANT FREQUENCY (UV TO IR), AND RELIABILITY. IF TIME PERMITS, THE EFFECT OF THIS TECHNIQUE ON IGNITION DELAY TIME AND FLAMEHOLDING WILL BE ALSO STUDIED. ANTICIPATED BENEFITS FOR NAVAL AIRCRAFT PROPULSION SYSTEMS ARE RELIABLE RADIATIVE IGNITION AND FLAMEHOLDING. THESE OPTICAL AND NON-INTRUSIVE MEANS CAN ELIMINATE ENGINE-DEGRADING PRESSURE LOSSES PRODUCED BY CONVENTIONAL DEVICES, AND CAN OFFER A SIGNIFICANT REDUCTION IN IGNITION DELAY TIME RESULTING IN IMPROVED OVERALL COMBUSTION EFFICIENCY AND SHORTER COMBUSTOR SIZE.

MACROMAN INC
PO BOX 7 - 5345 BRADLEY RD
SOMIS, CA 93066
CONTRACT NUMBER:
THAD PERRY
TITLE:
RESOURCE ALLOCATION MODEL
TOPIC# 253 OFFICE: NAVAIR/NATC

A RESOURCE ALLOCATION MODEL IS ARCHITECTED TO OPERATE ON NAVAL AIR TEST CENTERS MICROCOMPUTERS. THE MODEL REFLECTS ALL RESOURCE ELEMENTS REQUIRED FOR THE CONDUCT OF TESTS AND EVALUATIONS AT NATC. A SYSTEMS CONCEPT IS APPLIED RESULTING IN A OCTAHEDRON OF RESOURCE INFORMATION AND DATA BREAKDOWN STRUCTURE. THE MODEL IS CAPABLE OF HANDLING EIGHT CATEGORIES OF RESOURCE SETS. THE COMPUTER APPLICATION DRAWS ON THE ELECTRONIC SPREADSHEET CONCEPT CONFIGURED, HOWEVER TO DECISION TREE STRUCTURES AND CAPABLE OF HANDLING RESOURCES RE-

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QUIRED BY EITHER FUNCTIONAL OR PROJECT ORGANIZATIONAL HIERARCHIES. FUTURE GROWTH OF THE MODEL COULD INCLUDE SIMULATION CAPABILITY AS WELL AS EXPANSION TO EXPERT SYSTEMS AND ARTIFICIAL INTELLIGENCE.

MAINTENANCE REQUIREMENTS INC
76 SOUTHWOOD DR
ORINDA, CA 94563
CONTRACT NUMBER:
EPHRAIM REGELSON
TITLE:
APPLICATION OF AUTOMATION AND ROBOTICS TECHNOLOGY TO M
BATTERIES USED ABOARD SHIPS AIRCRAFT AND HELICOPTERS
TOPIC# 149 OFFICE: NSWC

BATTERY SERVICING AND MAINTENANCE HAVE BEEN DIFFICULT AND DANGEROUS CHORES SINCE BATTERIES WERE INVENTED. BATTERIES ARE OFTEN BOTH HEAVY AND CLUMSY AND ARE FULL OF CORROSIVE FLUIDS AND TOXIC MATERIALS. THEY OFTEN EMIT EXPLOSIVE AND POISONOUS FUMES. IN THIS SUBMITTAL MAINTENANCE REQUIREMENTS INC. PROPOSES TO INITIATE A CONCERTED EFFORT TO APPLY ROBOTIC AND AUTOMATION TECHNOLOGIES TO THE HANDLING, SERVICING, AND MAINTENANCE OF BATTERIES USED ABOARD SURFACE SHIPS, AIRCRAFT, HELICOPTERS, VEHICLES, GROUND SUPPORT EQUIPMENT, AND WEAPONS SYSTEMS. A HIGHLY COMPETENT KNOWLEDGEABLE TEAM WILL CONDUCT A DETAILED SURVEY OF PERTINENT ASPECTS OF BATTERY MAINTENANCE AND WILL DETERMINE WHICH SPECIFIC TASKS ARE SUITABLE FOR AUTOMATION. THE INFORMATION COLLECTED WILL BE ANALYZED TO DETERMINE THE LIKELY BENEFITS OF AUTOMATION FOR EACH TASK IDENTIFIED, AND A COMPREHENSIVE PLAN WILL BE DEVELOPED TO CONDUCT A PILOT PROGRAM TO APPLY ROBOTIC AND AUTOMATION TECHNOLOGIES TO THE TASKS SELECTED. THE ROBOTICS FACILITY AT CALIFORNIA STATE UNIVERSITY, SACRAMENTO, WILL BE USED TO DEMONSTRATE THE FEASIBILITY OF SELECTED CONCEPTS.

MASSA PRODUCTS CORP
280 LINCOLN ST
HINGHAM, MA 02043
CONTRACT NUMBER:
DONALD P MASSA
TITLE:
PIEZOELECTRIC/MAGNETOSTRICTIVE SONAR TRANSDUCER
TOPIC# 54 OFFICE: NAVSEA

SUBMITTED BY

AN UNDERWATER SONAR TRANSDUCER WHICH COMBINES BOTH MAGNETOSTRICTION AND PIEZOELECTRICITY WILL BE STUDIES AND EVALUATED DURING PHASE I. THIS HYBRID TRANSDUCER HAS BEEN DESCRIBED IN U.S. PATENT 4,443,731 (BUTLER AND CLARK, HYBRID PIEZOELECTRIC AND MAGNETOSTRICTIVE ACOUSTIC WAVE TRANSDUCER) AND HAS THE POSSIBILITY OF PROVIDING CANCELLATION OF THE MOTION AT ONE END OF THE DEVICE AS WELL AS PROVIDING ELECTRICAL SELF TUNING. THE FEASIBILITY OF SUCH A TRANSDUCER YIELDING THESE USEFUL CHARACTERISTICS WILL BE STUDIED BY MEANS OF COMPUTER SIMULATION AND EVALUATED EXPERIMENTALLY BY SIMPLE MODELS DESIGNED TO TEST THE UNIQUE FEATURES OF THIS HYBRID TRANSDUCER.

MATERIAL CONCEPTS INC
666 N HAGUE AVE
COLUMBUS, OH 43204
CONTRACT NUMBER:
JANA L JACKSON
TITLE:
GRAPHITE REINFORCED MAGNESIUM AS AN ALUMINA MATCHING L
COEFFICIENT OF THERMAL EXPANSION MATERIAL
TOPIC# 124 OFFICE: NSWC

BECAUSE OF ADVANCES IN INTEGRATED CIRCUIT USE AND MANUFACTURE, NEWER LOGIC AND MEMORY CHIPS ARE MORE POWERFUL AND HENCE GIVE OFF MORE HEAT. DIFFICULTIES HAVE BEEN ENCOUNTERED IN BONDING ALUMINUM CHIP CARRIERS TO ALUMINUM SUPPORT STRUCTURES, BECAUSE THE DIFFERENCE IN THERMAL EXPANSION (CTE) OF THESE MATERIALS CAUSES BOND FAILURE AT THE TEMPERATURES CREATED BY THE LARGER CHIP HEAT DISSIPATION. GRAPHITE/MAGNESIUM (Gr/Mg) COMPOSITE MATERIAL OFFERS AN ATTRACTIVE ALTERNATIVE TO ALUMINUM FOR SUPPORT STRUCTURES, BOTH BECAUSE OF ITS LOW WEIGHT AND GOOD MECHANICAL PROPERTIES AND BECAUSE ITS CTE CAN BE TAILORED TO MATCH THE CTE OF NEARLY ANY CHIP CARRIER MATERIAL. THE PURPOSE OF THIS PROGRAM IS TO DEMONSTRATE THAT CAST Gr/Mg CAN BE FABRICATED HAVING A QUASI-ISOTROPIC PLANAR CTE MATCHING THAT OF ALUMINA, AND THAT THERMAL CYCLING DOES NOT CAUSE BOND FAILURE BETWEEN THIS MATERIAL AND AN ALUMINA COATING.

MATERIALS & ELECTROCHEMICAL RSCH (MER)
4233 S FREMONT AVE
TUCSON, AZ 85714
CONTRACT NUMBER:
DR J C WITHERS
TITLE:
A WHISKER CERMET FOR JOINING CERAMIC AND METAL COMPONE
DIESEL ENGINES
TOPIC# 82 OFFICE: NAVSEA

SUBMITTED BY

A MAJOR OBSTACLE EXISTS FOR JOINING CERAMIC COMPONENTS TO METAL STRUCTURAL COMPONENTS IN DIESEL ENGINES. TO BRIDGE THE DISPARITIES BETWEEN CERAMIC AND METAL COMPONENTS, A WHISKER-REINFORCED CERMET WILL BE DEVELOPED. THE WHISKER WILL BE THE SAME AS THE CERAMIC COMPONENT, AND A CERMET COMPOSITION WILL BE GRADED FROM THE CERAMIC COMPOSITION TO THE METAL COMPOSITION. A STATISTICAL EXPERIMENT INVESTIGATION WILL BE CONDUCTED TO DEVELOP CERMET COMPOSITION GRADATION AND WHISKER DENSITY. INDIVIDUAL COMPOSITIONAL LAYER PROPERTIES WILL BE MODELED AND UTILIZED TO DESIGN THE OVERALL CERMET COMPOSITE TO OPTIMIZE BRIDGING THE DISPARITIES BETWEEN THE CERAMIC AND METAL COMPONENTS. THE WHISKER-REINFORCED CERMET PROPERTIES WILL BE CHARACTERIZED TO ESTABLISH PROPERTIES FOR PRODUCING TEST PIECES FOR THERMAL CYCLING UNDER SIMULATED CONDITIONS AND FOR SUBSEQUENT ENGINE STAND TESTING.

MATERIALS RELIABILITY INC
PO BOX 949
NAPERVILLE, IL 60566
CONTRACT NUMBER:
J S SANTNER
TITLE:
REDUCTION OF CONSOLIDATION STRESS IN CERAMIC REINFORCE MATRIX COMPOSITES
TOPIC# 123 OFFICE: NSWC

METAL MATRIX COMPOSITES (MMC) OFFER COMPARABLE MICROCREEP RATES (MCR) AT A FRACTION OF THE COST FOR SPECIALLY PROCESSED ALLOYS IN STABLE MEMBER APPLICATIONS. RESIDUAL STRESSES ARE IMPORTANT TO CONTROL WHEN PARTS PER MILLION OF STRAIN ARE A CONCERN. LARGE VOLUME FRACTIONS OF CERAMIC REINFORCEMENT IN COMPOSITES WILL CONTRIBUTE TO BOTH THE MACRO AND MICRO RESIDUAL STRESSES. THE PROPOSED PROGRAM WILL INVESTIGATE THE USE OF A WORK HARDENING ALLOY (I.E. Al-Mg) RATHER THAN PRECIPITATION HARDENED ALLYS (I.E. Al-Zn AND Al-Cu) FOR STABLE MEMBER COMPONENTS. X-RAY DIFFRACTION TECHNIQUES WILL BE USED TO MEASURE THE MACRO AND MICRO RESIDUAL STRESSES, MICRO-CREEP TESTS WILL BE CONDUCTED, AND THE USE OF UP-QUENCHING (I.E., QUENCHING IN LIQUID NITROGEN) WILL BE INVESTIGATED AS A MEANS TO CONTROL RESIDUAL STRESSES. PHASE I WILL INCLUDE DEVELOPING A TEST TECHNIQUE FOR COMPARING THE RELATIVE MICROCREEP RATE AMONG SEVERAL CONDITIONS OF ALLOYS AND PRO-

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CESSES. THE BEHAVIOR OF A WORK HARDENING AND A PRECIPITATION HARDENING MATRIX ALLOY WILL BE COMPARED. LONG TERM AND STATISTICALLY SIGNIFICANT DATA WILL BE DEVELOPED IN PHASE II FOR DIFFERENT ALLOYS. PROCESSING BY UP-QUENCHING CYCLING TO CONTROL RESIDUAL STRESSES WILL ALSO BE EVALUATED. PHASE III WILL MANUFACTURE A COMPONENT USING THE BEST COMBINATION OF MATRIX ALLOY AND PROCESSING FROM PHASE II AND THE MCR RESULTS VERIFIED.

MATERIALS SCIENCES CORP
GWYNEDD PLAZA II - BETHLEHEM PIKE
SPRING HOUSE, PA 19477
CONTRACT NUMBER: N00164-87-C-0233
SAILENDRA N CHATTERJEE
TITLE:
SOFTWARE DEVELOPMENT FOR MATRIX COMPOSITE MATERIAL EVA
TOPIC# 179 OFFICE: NWSC/SSPO

CURRENTLY USED ANISOTROPIC YIELD CRITERIA FOR UNIDIRECTIONAL FIBER REINFORCED COMPOSITES UNDER MULTIAXIAL STRESS STATES WILL BE CRITICALLY REVIEWED FOR MODELING ELASTROPLASTIC AND PSEUDO-PLASTIC RESPONSES OF METAL AND ORGANIX MATRIX COMPOSITES, RESPECTIVELY. USE OF MICROMECHANICS BASED MODELS WILL ALSO BE CONSIDERED. SOFTWARES FOR MODELING SUCH RESPONSE WILL BE PREPARED WITH AND WITHOUT THE EFFECTS OF INTERLAMINAR STRESSES AND WILL BE UTILIZED FOR NONLINEAR LAMINATE ANALYSIS AND PREDICTION OF FINAL FRACTURE. IN ADDITION, TWO-DIMENSIONAL FINITE ELEMENT ANALYSES NEAR MAJOR CRACKS OR OTHER STRUCTURAL DETAILS ARE PROPOSED FOR PREDICTION OF IN-PLANE OR INTERLAMINAR FRACTURE. FURTHER APPLICATIONS AND THREE-DIMENSIONAL FINITE ELEMENT ANALYSES ARE SUGGESTED IN THE FOLLOWING PHASES.

MERIDIAN CORP
5113 LEESBURG PIKE - STE 700
FALLS CHURCH, VA 22041
CONTRACT NUMBER:
MARK D BRYFOGLE
TITLE:
MINIATURE CAPILLARY PUMPED HEAT TRANSFER COMPONENT
TOPIC# 6 OFFICE: ONR/NRL

SUBMITTED BY

THE NATURAL GENERATION OF HEAT WITHIN SEMICONDUCTOR DEVICES CAUSES SEVERAL PROBLEMS ASSOCIATED WITH HIGH OPERATING TEMPERATURES. THESE PROBLEMS INCLUDE POOR ELECTRICAL PERFORMANCE, INHOMOGENEOUS TEMPERATURE PROFILES, THERMAL DIFFUSION, AND THERMAL FATIGUE. THIS RESEARCH EFFORT WILL STUDY THE REDUCTION OF SEMICONDUCTOR JUNCTION TEMPERATURES AND LOCALIZED TEMPERATURE BUILDUPS BY THE FABRICATION OF CAPILLARY TUBES IN THE SUBSTRATE NEAR THE JUNCTION. THE CAPILLARIES WILL CARRY A WORKING FLUID WHICH WILL EXPERIENCE A PHASE CHANGE UPON ABSORPTION OF HEAT IN THE VICINITY OF THE JUNCTION. THE RESULTING VAPOR WILL PASS TO A COLD REGION, WHERE IT WILL CONDENSE AND BE DRAWN INTO THE CAPILLARIES BY CAPILLARY ACTION. A COMPUTER MODEL WILL BE DEVELOPED TO PREDICT THE HEAT TRANSFER CAPABILITIES OF THE DEVICE AND TO POSTULATE AN OPTIMUM DESIGN. THIS OPTIMUM DESIGN WILL BE FABRICATED AND TESTED IN THE LABORATORY DURING PHASE I. HENCE, THE TECHNICAL FEASIBILITY, MANUFACTURABILITY AND COST EFFECTIVENESS OF THIS CONCEPTUAL APPROACH TO ELECTRONICS COOLING WILL BE DEVELOPED AS A RESULT OF PHASE I.

METAMATIX INC
7525 BOBBYBOYAR AVE
CANOGA PARK, CA 91304
CONTRACT NUMBER: N00164-87-C-0193
RICHARD B MINCH
TITLE:
PASSIVE VARIABLE THERMAL RESISTANCE DEVICE
TOPIC# 181 OFFICE: NWSC/SSPO

TWO-PHASE FLOW TECHNOLOGIES ARE USED TO CREATE PASSIVE DEVICES HAVING VARIABLE THERMAL RESISTANCES WHICH ARE A FUNCTION OF THE HEAT FLUX PRESENT. THE DEVICES ARE IN MATERIAL FORM AND THEREFORE EASILY INCORPORATED AS STRUCTURAL MEMBERS, ELECTRICAL OR MAGNETIC CIRCUIT ELEMENTS, OR OPTICAL COMPONENTS. DEVICE DESIGN APPROACH IS PRESENTED IN SYSTEMS ENGINEERING TERMS, SUBSYSTEMS PERFORMANCE REQUIREMENTS IDENTIFIED, CONCEPTS PRESENTED FOR EACH SUBSYSTEM WHICH WILL ALLOW THE DESIRED FUNCTIONAL RELATIONSHIPS BETWEEN THERMAL RESISTANCE AND FLUX, UNIQUE FABRICATION AND MATERIALS CONCEPTS DISCUSSED. AN OVERALL PLAN FOR EXPERIMENT, FABRICATION AND TEST IN PHASE II PROPOSED AND ADDITIONAL APPLICATIONS PRESENTED.

MICRILOR INC
NINE LAKESIDE OFFICE PK
WAKEFIELD, MA 01880
CONTRACT NUMBER:
JOHN H CAFARELLA
TITLE:
SHORT-RANGE UNDERWATER COMMUNICATIONS
TOPIC# 196 OFFICE: NUSC

SUBMITTED BY

THERE ARE MANY SITUATIONS IN WHICH NAVAL FORCES REQUIRE THE ABILITY TO COMMUNICATE OVER SHORT RANGES UNDERWATER. THESE COMMUNICATIONS MUST BE EFFECTED THROUGH A CHANNEL WHICH EXHIBITS SEVERE MULTIPATH AND REVERBERATION. BACKGROUND INTERFERENCE CAN ARRIVE FROM GREAT DISTANCES IN THE OCEAN, DISRUPTING UNDERWATER SOUND SYSTEMS. IN ADDITION, IT IS OFTEN DESIRED TO KEEP THE COMMUNICATIONS COVERT; THIS REQUIRES THAT MINIMUM POWER BE UTILIZED AND THAT ALL STEPS POSSIBLE BE TAKEN TO HIDE THE COMMUNICATIONS. RADIO TECHNIQUES EXIST WHICH CAN SUPPRESS INTERFERENCE AND ENABLE THE IMPLEMENTATION OF ANTIMULTI-PATH TECHNIQUES. THE DEVELOPMENT PROPOSED HEREIN WOULD EXPLOIT WELL-DEVELOPED TECHNIQUES FROM THE RADIO-COMMUNICATION FIELD TO PROVIDE FOR RELIABLE UNDERWATER COMMUNICATIONS USING SOUND; AND ENABLE COVERT COMMUNICATIONS IF REQUIRED.

MICROCOMPATIBLES INC
301 PRELUDE DR
SILVER SPRING, MD 20901
CONTRACT NUMBER:
DILIP K SOM
TITLE:
APPLICATION OF 3D COMPUTER GRAPHICS TO ENHANCE THE REL MANUFACTURING WORK CELLS
TOPIC# 146 OFFICE: NSWC

A NOVEL SOLID MODELING METHOD WILL BE APPLIED TO ASSIST IN THE RELIABLE AND EFFICIENT OPERATION OF CERTAIN KEY COMPONENTS OF AN AUTOMATED MANUFACTURING CELL. THE FOCUS WILL BE ON THE VALIDATION OF THE INPUT PROGRAM FOR NUMERICAL CONTROLLED (NC) MACHINES. HOWEVER APPLICATIONS TO REAL-TIME MOTION PLANNING FOR ROBOTS AND COORDINATE MEASURING MACHINE PROBES REPRESENT IMPORTANT "SPIN-OFF" BENEFITS. THE PROJECT WILL PROVIDE AN EFFICIENT AND ECONOMICAL MECHANISM TO GENERATE A 3D GRAPHICAL EMULATION OF NC MACHINING, PROVIDING DIMENSIONAL INFORMATION AND CHECKS FOR UNDESIRED TOOL/SPINDLE/FIXTURE/WORKPIECE COLLISIONS. MULTI-AXIS TOOL MOTIONS AND A SPECTRUM OF MILLING TOOL GEOMETRICS WILL BE ACCOMMODATED. IN ADDITION, AN AUTOMATED VERIFICATION CAPABILITY WILL BE CREATED. THESE PROGRAMS ARE FEASIBLE BECAUSE OF CERTAIN SPECIAL FEATURES OF THE PROPOSED SOLID MODEL SYSTEM, PARTICULARLY A CAPABILITY FOR VERY FAST ROOLEAN OPERATIONS.

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MILLIMETER WAVE TECHNOLOGY
1395 MARIETTA PKWY - BLDG 700
MARIETTA, GA 30067
CONTRACT NUMBER:
D J KOZAKOFF
TITLE:
EHF FLUSH MOUNTED CONFORMAL ARRAY FOR AIRCRAFT COMMAND COMMUNICATIONS SYSTEMS
TOPIC# 106 OFFICE: NAVAIR

THIS RESEARCH WILL QUANTIFY THE THEORETICAL BASIS AND PERFORMANCE OF A NEW CLASS OF ANTENNAS WITH BEAM STEERING CAPABILITY. THE APPROACH IS BASED ON QUASI-OPTICAL TECHNIQUES IN CONJUNCTION WITH A NOVEL BULK PHASE SHIFTER DESIGN CONCEPT. IN ONE IMPLEMENTATION, THE PHASE SHIFTER MAY BE MECHANICALLY ADJUSTED BY SOLENOIDS, THEREFORE PROVIDING IMPROVED ELECTRICAL PERFORMANCE AND MUCH LOWER COSTS THAN A CONVENTIONAL PHASED ARRAY THAT USES DISCRETE FERRITE PHASE SHIFTERS. THE ANTENNA MAY BE IMPLEMENTED IN A FLUSH CONFORMED CONFIGURATION, AMENABLE FOR AIRCRAFT APPLICATIONS.

MILLITECH CORP
PO BOX 109 - S DEERFIELD RSCH PK
SOUTH DEERFIELD, MA 01373
CONTRACT NUMBER:
G RICHARD HUGUENIN
TITLE:
MODULAR MILLIMETER WAVE FMCW SENSOR
TOPIC# 84 OFFICE: NAVSEA

MILLITECH PROPOSES A MILLIMETER WAVE FMCW SENSOR SYSTEM TO SATISFY THE GROWING NEED FOR A SMALL, MODULAR, AND INEXPENSIVE SHORT RANGE NON-CONTACT RANGING SYSTEM FOR ROBOT COLLISION AVOIDANCE. USE OF MILLIMETER WAVES OVERCOMES MOST OF THE SHORT-COMINGS OF EXISTING ULTRASONIC AND INFRARED SENSORS. MILLIMETER WAVE SENSORS ARE ABLE TO OPERATE IN SUCH ADVERSE ENVIRONMENTS AS SMOKE, DUST, CHEMICAL SMOG, FOG, SNOW, ETC., WHICH BLIND MOST INFRARED AND VISUAL SYSTEMS. MILLIMETER WAVES, UNLIKE ULTRASOUND WAVES, ARE ELECTROMAGNETIC WAVES,

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AND THUS ARE QUITE INSENSITIVE TO CHANGING TEMPERATURE AND OTHER PROPERTIES OF THE ENVIRONMENT. MILLIMETER WAVE SENSORS CAN BE MADE 100-1000 TIMES SMALLER THAN COMPARABLE MICROWAVE SENSORS. MILLIMETER WAVE TECHNOLOGY, PARTICULARLY IN THE AREA OF LOW-COST, HIGH-PERFORMANCE ASSEMBLIES, HAS MADE GREAT STRIDES RECENTLY, SO THAT IT IS NOW ENTIRELY PRACTICAL TO MAKE INEXPENSIVE SENSORS OF THE TYPE PROPOSED. HYBRID MILLIMETER WAVE INTEGRATED CIRCUITS WILL ALLOW, IN PRODUCTION QUANTITIES, COSTS OF ONLY SEVERAL HUNDRED DOLLARS PER SENSOR MODULE, MAKING SUCH HIGH-PERFORMANCE SENSORS VERY COST-EFFECTIVE. IN PHASE I, WE PROPOSE A SET OF DESIRED SPECIFICATIONS IN CONSULTATION WITH THE END USERS, AND BUILD A BRASSBOARD SENSOR TO TEST CERTAIN ALGORITHMS AND SYSTEM OPTIONS. BASED ON THE RESULTS OF THIS WORK, WE WILL DEVELOP A BASELINE SYSTEM DESIGN AND COST MODELS FOR A MODULAR MILLIMETER WAVE FMCW SENSOR FOR COLLISION AVOIDANCE.

MISSION SCIENCES CORP
6090 JERICHO TURNPIKE
COMMACK, NY 11725
CONTRACT NUMBER:
ARNOLD NOVICK
TITLE:
SHALLOW WATER SONAR SYSTEM
TOPIC# 50 OFFICE: NAVSEA

A SHALLOW WATER SONAR SYSTEM WILL BE DESIGNED AND ANALYZED USING A UNIQUE RAY-BASED SHALLOW WATER PROPAGATION AND REVERBERATION MODEL. THE BASELINE CANDIDATE SYSTEM IS A PLANAR ARRAY SONAR IN A VDS CONFIGURATION. THE ARRAY USES LIGHTWEIGHT CYLINDRICAL TRANSMITTING ELEMENTS AND DIFAR RECEIVING ELEMENTS TO ACHIEVE EXCELLENT PERFORMANCE IN A COMPACT CONFIGURATION. ITS SIZE AND WEIGHT ARE APPROPRIATE FOR DEPLOYMENT FROM SMALL SHIPS. THE BASELINE SYSTEM WILL BE EVALUATED IN A NUMBER OF SELECTED SHALLOW WATER ENVIRONMENTS RANGING FROM 240 TO 6000 FEET. THE ARRAY BEAM PATTERN WILL BE OPTIMIZED TO EXPLOIT SPATIAL NOISE ANISOTROPIES ASSOCIATED WITH THE HIGHER LOSS ENVIRONMENTS, THEREBY RELIABLY ACHIEVING TARGET DETECTION RANGES OF AT LEAST 15 KILOYARDS.

MPR ASSOCS INC
1050 CONNECTICUT AVE NW - STE 400
WASHINGTON, DC 20036
CONTRACT NUMBER:
HANS GIESECKE
TITLE:
AIRCRAFT SUPPORT EQUIPMENT SHOCK RESPONSE
TOPIC# 210 OFFICE: NAEC/NAVAIR

SUBMITTED BY

A FEASIBILITY STUDY IS PROPOSED TO DEMONSTRATE AN ANALYSIS TECHNIQUE FOR PREDICTING THE SHOCK RESPONSE OF SHIPBOARD AIRCRAFT SUPPORT EQUIPMENT. THE PREDICTED RESPONSE OF INDIVIDUAL COMPONENTS, SUCH AS CRT'S, TAPE DRIVES, AND PC BOARDS, WOULD BE AUTOMATICALLY COMPARED TO EITHER THE COMPONENTS SPECIFICATIONS OR TEST DATA AND THE USER WOULD BE NOTIFIED OF THOSE COMPONENTS WITH RESPONSE LEVELS EXCEEDING THEIR ALLOWABLE LIMITS.

MSB SYSTEMS INC
50 WASHINGTON ST
NORWALK, CT 06854
CONTRACT NUMBER:
BERNARD LICHTENSTEIN
TITLE:
BROADBAND TRANSDUCER/AMPLIFIER TECHNIQUES
TOPIC# 45 OFFICE: NAVSEA

THE REQUIREMENTS OF SPREAD SPECTRUM TECHNOLOGY, ACOUSTIC COMMUNICATION, AND SIGNAL SPECTRUM CODING MAKE IT NECESSARY TO INCREASE THE EFFECTIVE BANDWIDTH OF THE SONAR PROJECTOR. A UNIQUE APPROACH TO DOING THIS WITHOUT SACRIFICING THE TRANSMITTING AND RECEIVING RESPONSES OR TOTALLY REDESIGNING THE TRANSDUCER, IS TO APPLY THE TECHNIQUE OF NEGATIVE IMPEDANCE. THE MAJOR GOALS OF PHASE I WILL BE TO (1) SHOW THE FEASIBILITY OF USING A NEGATIVE IMPEDANCE DEVICE TO SIGNIFICANTLY INCREASE THE BANDWIDTH OF AN OPERATIONAL SONAR PROJECTOR, AND (2) TO GENERATE THE DESIGN AND TEST SPECIFICATIONS OF THAT DEVICE FOR EVALUATION IN PHASE 2. THE TECHNICAL TASKS INCLUDE A TECHNOLOGY REVIEW OF NEGATIVE IMPEDANCE AMPLIFIERS, A DETAILED COMPUTER SIMULATION AND PARAMETRIC ANALYSIS, AND THE DESIGN OF A NEGATIVE IMPEDANCE DEVICE TO WORK WITH A SPECIFIC PROJECTOR AND DRIVER AMPLIFIER.

MSI ELECTRONICS INC
34-32 57TH ST
WOODSIDE, NY 11377
CONTRACT NUMBER:
HERBERT BLENNER
TITLE:
CONDUCTIVITY METER FOR GRAPHITE EPOXY
TOPIC# 161 OFFICE: NSWC

SUBMITTED BY

THE ELECTRICAL CONDUCTIVITY OF GRAPHITE EPOXY COMPOSITE MATERIAL IS A FUNCTION OF THE RELATIVE ORIENTATION OF THE APPLIED FIELD AND THE FIBER DIRECTION FOR UNIDIRECTIONAL MATERIAL. PRIOR ATTEMPTS AT NON-CONTACT, NONDESTRUCTIVE ELECTROMAGNETIC METHODS OF CONDUCTIVITY MEASUREMENT HAVE NOT BEEN FULLY SUCCESSFUL DUE TO LOW LEVELS OF SIGNAL OR IMPROPER ORIENTATION OF THE ELECTROMAGNETIC FIELDS. TWO PROPRIETARY APPROACHES TO OVERCOMING THE DEFICIENCIES HAVE BEEN FORMULATED; ONE AT MICROWAVE FREQUENCIES USING REFLECTIVITY MEASUREMENT AND THE OTHER AT LOWER FREQUENCIES EXPLOITING THE IMPEDANCE CHANGES AND MICROCOMPUTER SUPPORT OF A SPECIALLY DESIGNED, CALIBRATED EDDY CURRENT PROBE. IT IS PROPOSED THAT BOTH THESE APPROACHES BE EXPERIMENTALLY STUDIED IN DETAIL SO THAT THEIR FEASIBILITY CAN BE DETERMINED, THEIR RELATIVE COST EFFECTIVENESS DETERMINED AND THE DATA BASE AND APPROACH TO PROTOTYPE FIELD USABLE SYSTEM DESIGN BE GENERATED.

MSNW INC
PO BOX 865
SAN MARCOS, CA 92069
CONTRACT NUMBER:
DR GEORGE H REYNOLDS
TITLE:
IMPROVING THE UNIFORMITY OF CHEMICAL VAPOR INFILTRATIO
HfB2 INTO FIBER PREFORMS
TOPIC# 136 OFFICE: NSWC

THIS PROJECT WILL EXAMINE THE UTILITY OF ALTERNATIVE METAL AND NONMETAL PRECURSOR SPECIES FOR CHEMICAL VAPOR INFILTRATION OF HfC AND HfB2 INTO CARBON FIBER AND BORON FILAMENT PREFORMS, RESPECTIVELY. IN PARTICULAR, THE USE OF PRECURSOR SPECIES WHICH REACT SLOWLY TO DEPOSITE THE MATRIX MATERIAL AT SLOWER RATES, THUS PROVIDING MORE UNIFORM DEPOSITION THROUGHOUT THE BULK OF THE FIBER PREFORM WHICH MAY AID IN ACHIEVING HIGHER MATRIX DENSITIES, WILL BE EMPHASIZED. A SYSTEMATIC SERIES OF EXPERIMENTS UTILIZING VARIOUS PERMUTATIONS OF METAL AND NONMETAL PRECURSOR SPECIES, DEPOSITION TEMPERATURES, TOTAL SYSTEM PRESSURES AND PRECURSOR GAS PARTIAL PRESSURES WILL BE PERFORMED. DEPOSIT UNIFORMITY (AT THE PREFORM SURFACE VERSUS INTERIOR REGIONS) AND STOICHIOMETRY AND OVERALL PROCES DEPOSITION RATES AND EFFICIENCIES WILL BE QUANTITATIVELY DETERMINED. THE PROPOSED APPROACH IS EXPECTED TO BE COMPLEMENTARY TO OTHER APPROACHES BEING STUDIED

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FOR ACHIEVING HIGHER MATRIX DENSITIES SUCH AS THE USE OF TEMPERATURE OR PRESSURE GRADIENTS DURING DEPOSITION. THE PROJECT WILL BE PERFORMED WITH THE ASSISTANCE OF RENSSELAER POLYTECHNIC INSTITUTE AS A SUBCONTRACTOR.

MULTISPEC CORP
25 BLACK LATCH LN
CHERRY HILL, NJ 08003
CONTRACT NUMBER:
DR DAVID SHEBY
TITLE:
BROADBAND ACOUSTIC CHARACTERIZATION THROUGH SOURCE DEC
USING MULTISPECTRAL ANALYSIS TECHNIQUES
TOPIC# 31 OFFICE: SPAWAR

MULTISPECTRAL ANALYSIS TECHNIQUES PERMIT ANALYSIS OF NONLINEARITIES GIVING RISE TO CERTAIN BROADBAND SIGNALS. THE ADVANTAGES OF THIS TECHNIQUE OVER LINEAR METHODS ARE DETAILED.

NDT TECHNOLOGIES INC
PO BOX 637 - 150 STRONG RD
SOUTH WINDSOR, CT 06074
CONTRACT NUMBER:
DR HERBERT R WEISCHEDEL
TITLE:
POWER AMPLIFICATION FOR UNDERWATER ELECTROACOUSTIC TRA
TOPIC# 17 OFFICE: ONT

EXPLORATORY DESIGN, DEVELOPMENT AND DEMONSTRATION OF A COMPACT SWITCHMODE POWER AMPLIFIER FOR UNDERWATER ACOUSTIC TRANSDUCERS IS PROPOSED. THIS AMPLIFIER WILL PERMIT THE HIGHLY EFFICIENT EXCITATION OF A HIGH-POWER BROADBAND SONAR PROJECTOR OVER A MINIMUM OCTAVE FREQUENCY BAND AROUND THE MECHANICAL RESONANCE OF THE TRANSDUCER. AT THE SELECTABLE TUNED FREQUENCY SUCH AN AMPLIFIER/TRANSDUCER SYSTEM WILL PRODUCE A HIGH-FIDELITY ACOUSTIC SIGNAL. THE OBJECTIVES OF THE PHASE I EXPLORATORY EFFORT ARE: (i) TO DEMONSTRATE FEASIBILITY OF SUCH A POWER AMPLIFIER, (ii) TO DETERMINE AN OPTIMUM DESIGN OF A POWER AMPLIFIER FOR HIGH-POWER UNDERWATER ACOUSTIC TRANSDUCERS, AND,

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FINALLY, (iii) TO DEMONSTRATE THE VIABILITY OF THE PROPOSED CONCEPTS BY BUILDING AND EVALUATING A SMALL-SCALE PROTOTYPE OF THE PROPOSED POWER AMPLIFIER. A SET OF PERFORMANCE SPECIFICATIONS REFLECTING THE REQUIREMENTS OF THE US NAVY WILL FIRST BE DETERMINED. THEN, USING THESE SPECIFICATIONS, THE PROPOSED DESIGN AND TRADE-OFF STUDIES WILL CONSIDERED AND EVALUATED SEVERAL FAMILIES OF A RESONANT POWER AMPLIFIERS. TO DEMONSTRATE THE VIABILITY OF THE PROPOSED OPTIMUM DESIGN, A SMALL-SCALE PROTOTYPE BREADBOARD WILL BE BUILT AND EVALUATED. FINALLY, AFTER AN OPTIMUM AMPLIFIER CONFIGURATION HAS BEEN DETERMINED, A PRELIMINARY DESIGN OF THE POWER AMPLIFIER WILL BE PRESENTED.

NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER:
DR L I PERLOVSKY
TITLE:
FIELD THEORETICAL MODEL OF ACOUSTIC PROPAGATION WITH R BOUNDARIES
TOPIC# 53 OFFICE: NAVSEA

A NOVEL APPROACH IS TAKEN IN THIS PROPOSAL FOR THE RIGOROUS TREATMENT OF THE PROBLEM OF ACOUSTIC WAVE PROPAGATION THROUGH SHALLOW WATER BOUNDED BY ICE AND BOTTOM WITH ROUGH SURFACES. THIS TREATMENT INCLUDES A FIELD-THEORETIC CONSIDERATION OF WAVE PROPAGATION AND A STATISTICAL-PHYSICS MODEL OF ROUGH ICE AND BOTTOM SURFACES. THE FIELD-THEORETIC MODEL SHALL ACCOUNT FOR ALL MODES OF WAVE PROPAGATION IN LAYERED MEDIA AND TREAT THE INTERACTION WITH ROUGH SURFACES BY EXPANDING THE EXACT SOLUTION INTO PERTURBATION SERIES IN POWERS OF A SMALL PARAMETER, THE RELATIVE ENERGY LOSS PER WAVELENGTH. IT ACCOUNTS FOR WAVE INTERACTIONS WITH FLUCTUATIONS OF BOTH GEOMETRICAL SHAPE AND RIGIDITY, WHICH ARE KNOWN TO CAUSE SIGNIFICANT ENERGY LOSSES. A MODEL BASED ON THE THEORY OF PHASE TRANISTIONS BETWEEN LIQUID, NON-RIGID, AND RIGID PHASES IS USED TO DESCRIBE THE ROUGH ICE AND BOTTOM SURFACES. THIS MODEL WILL PREDICT THE RIGIDITY FLUCTUATIONS IN ICE ON THE BOTTOM AND ALSO RELATE THE GEOMETRICAL DISTRIBUTION OF ICE AND BOTTOM ROUGHNESS TO THE AVERAGE LOCAL ENERGY DISTRIBUTIONS ON DIFFERENT SCALES. THE MODEL RESULTS ARE COMPARED WITH EXISTING DATA.

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NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER:
JOSEPH MUDAR
TITLE:
SEARCH SENSOR INNOVATION
TOPIC# 256 OFFICE: NAVAIR/NATC

A LIGHTER-THAN-AIR VEHICLE MOUNTED LONG-RANGE INFRARED SEARCH AND TRACK SENSOR IS PROPOSED THAT UTILIZES A LARGE-DIAMETER COLLECTING PRIMARY MIRROR. THE PERFORMANCE OF THE IR SENSOR SYSTEM WOULD BE ANALYZED IN TERMS OF DETECTION RANGE FOR A VARIETY OF OPERATIONAL SCENARIOS AND TARGETS.

NICHOLS RESEARCH CORP
4040 S MEMORIAL PKWY
HUNTSVILLE, AL 35802
CONTRACT NUMBER:
THOMAS W TUER
TITLE:
INFRARED SEA BACKGROUND MODELING AND MODEL VALIDATION
TOPIC# 130 OFFICE: NSWC

NICHOLS RESEARCH CORPORATION PROPOSES TO DEVELOP AN ACCURATE AND USABLE COMPUTER MODEL FOR PREDICTING THE INFRARED RADIANCE FROM THE SURFACE OF THE SEA AS A FUNCTION OF THE ENVIRONMENTAL CONDITIONS AND THE SEA STATE. THE MODEL WOULD CALCULATE THE THERMAL RADIATION EMITTED FROM THE SEA SURFACE AND THE RADIATION FROM OTHER SOURCES THAT IS REFLECTED BY THE SEA SURFACE. THE REFLECTANCE MODEL WOULD ACCOUNT FOR THE STATISTICAL CHARACTERISTICS OF THE THREE-DIMENSIONAL PROFILE OF THE WATER-AIR INTERFACE. TEMPERATURE OF THE WATER NEAR THE INTERFACE WOULD BE MODELED STATISTICALLY BASED ON EMPIRICAL DATA FOR THE LOCALE OF INTEREST. ATMOSPHERIC MODELS WOULD ACCOUNT FOR ATTENUTATION BY AND RADIANCE FROM THE ATMOSPHERE IN THE PATH FROM THE SEA SURFACE TO THE SENSOR BEING CONSIDERED. EXISTING MODELS WOULD BE USED WHEREVER POSSIBLE. A VALIDATION PLAN FOR THE COMPUTER MODEL

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WOULD BE DEVELOPED FOR PHASE-II. THE PLAN WOULD HAVE RECOMMENDATIONS FOR MEASUREMENTS OF SEA RADIANCE AT VARIOUS CONDITIONS TO VALIDATE THE MODEL, AND FOR INSTRUMENTATION TO COLLECT THE DATA. THE VALIDATION PLAN WOULD INCLUDE A SCHEDULE AND BUDGET FOR THE INSTRUMENTATION ACQUISITION; DATA COLLECTION, REDUCTION AND ANALYSIS, AND CODE VALIDATION.

NKF ENGINEERING INC
12200 SUNRISE VALLEY DR
RESTON, VA 22091
CONTRACT NUMBER:
DR MICHAEL P PAKSTYS
TITLE:
ENHANCED UNDERSEA WARHEADS
TOPIC# 21 OFFICE: ONT/NSWC

DEVELOPMENT OF AN ARMOR PIERCING PROJECTILE DESIGNED TO PERFORATE DOUBLE-HULLED UNDERWATER SUBMARINE TARGETS IS PROPOSED. THE LIMITING VELOCITY NEEDED TO PERFORATE THE TARGET IS OBTAINED USING A UNIQUE CONCEPT. THE PROPELLER WILL BE DELIVERED WITH A STANDARD SIZE TORPEDO AND UPON INITIAL IMPACT, WILL BE ACCELERATED TO THE DESIRED TERMINAL VELOCITY. PHASE I OF THE PROJECT WILL CONSIST OF A DESIGN FEASIBILITY STUDY COMPLETE WITH DRAWINGS FOR INITIAL TESTING. PHASE II WILL CONSIST OF FURTHER DESIGN, PROTOTYPING AND TESTING OF THE WEAPON. THE CONCEPT WILL BE DEVELOPED IN COOPERATION WITH APPLIED ORDNANCE TECHNOLOGY, INC.

NKF ENGINEERING INC
12200 SUNRISE VALLEY DR
RESTON, VA 22091
CONTRACT NUMBER:
DR RODERICK BARR
TITLE:
PERFORMANCE OF ROBOTIC SYSTEMS IN A NAVAL ENVIRONMENT
TOPIC# 247 OFFICE: DTNSRDC

AN EFFORT TO ESTABLISH A METHODOLOGY FOR ASSESSING THE EFFECT OF SHIPBOARD ENVIRONMENT ON INDUSTRIAL STYLE ROBOTS AND ROBOTIC SYSTEMS

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IS DESCRIBED. THIS METHODOLOGY IS INTENDED TO PROVIDE: 1.) METHODS FOR ASSESSING THE EFFECT ON SHIPBOARD ROBOTIC SYSTEM PERFORMANCE, RELIABILITY, AND SERVICE LIFE OF SHIP MOTIONS, VIBRATIONS, WETNESS AND AVAILABLE SHIPBOARD SPACE; 2.) A BASIS FOR DEVELOPING DURING PHASE II A MORE COMPREHENSIVE METHOD FOR ASSESSING SUCH EFFECTS. THESE METHODS WILL PROVIDE GUIDANCE FOR MODIFICATION OF EXISTING ROBOTIC SYSTEMS TO PERMIT THEIR EFFECTIVE USE ON NAVAL SHIPS. THE EFFORT IS DIVIDED INTO FIVE PARTS: 1.) DEVELOPMENT OF METHODS FOR ASSESSING THE EFFECT OF MOTIONS AND VIBRATIONS ON TYPICAL ROBOTIC SYSTEMS; 2.) DEVELOPMENT OR IDENTIFICATION OF SUITABLE METHODS FOR PREDICTING RELEVANT SHIP MOTIONS AND VIBRATION; 3.) ASSESSMENT OF THE EFFECT OF WETNESS ON CORROSION AND RELIABILITY; 4.) ASSESSMENT OF SPACE REQUIRED FOR EFFECTIVE OPERATION; 5.) APPLICATION OF THESE METHODS TO AN EXAMPLE APPLICATION OF INTEREST.

NKF ENGINEERING INC
12200 SUNRISE VALLEY DR
RESTON, VA 22091
CONTRACT NUMBER:
DR RODERICK BARR
TITLE:
SHIP MOTIONS EFFECTS ON SHIPBOARD ROBOTIC SYSTEMS
TOPIC# 85 OFFICE: NAVSEA

AN EFFORT TO ESTABLISH A METHODOLOGY FOR ASSESSING THE EFFECT ON SHIPBOARD ROBOTIC SYSTEMS OF SEAWAY INDUCED SHIP MOTIONS, VELOCITIES AND ACCELERATIONS IS DESCRIBED. THIS METHODOLOGY IS INTENDED TO PROVIDE: 1.) METHODS FOR ASSESSING THE IMPACT AND EFFECTS ON SHIPBOARD ROBOTIC SYSTEM PERFORMANCE, RELIABILITY, SAFETY AND SERVICE LIFE OF SHIP MOTIONS AND; 2.) A BASIS FOR DEVELOPING DURING PHASE II A MORE COMPREHENSIVE METHOD FOR ASSESSING SUCH EFFECTS. THESE METHODS WILL ALSO PROVIDE GUIDANCE FOR MODIFICATION OF EXISTING ROBOTIC SYSTEMS TO PERMIT THEIR USE ON NAVAL SHIPS AND FOR THE DESIGN OF FUTURE SHIPBOARD ROBOTIC SYSTEMS. THE EFFORT IS DIVIDED INTO THREE TASKS: 1.) DEVELOPMENT OF METHODS FOR ASSESSING MOTIONS EFFECTS FOR TYPICAL ROBITIC SYSTEMS; 2.) DEVELOPMENT OF A SUITABLE METHOD FOR PREDICTING RELEVANT SHIP MOTIONS AND COMBINATIONS OF MOTIONS AND; 3.) APPLICATION OF THESE METHODS USING AN EXAMPLE APPLICATION OF CURRENT INTEREST TO NAVSEA.

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OCEAN & ATMOSPHERIC SCIENCE INC
145 PALISADE ST
DOBBS FERRY, NY 10522
CONTRACT NUMBER:
ROSS E WILLIAMS
TITLE:
SUPERCONDUCTING CABLE DESIGN FOR POWER TRANSMISSION WI
DEVELOPMENT IN THE OPEN OCEAN
TOPIC# 108 OFFICE: NAVAIR/NCSC

OAS PROPOSES THE USE OF CONDUIT ENCLOSED SUPERCONDUCTING CABLE WITH INTERNAL LIQUID HELIUM COOLING FOR POWER TRANSMISSION IN THE OPEN OCEAN. NIOBIUM-TITANIUM, NIOBIUM-TIN, AND THE NEWER LANTHANUM-COPPER-BARIUM-OXYGEN COMPOUND WILL BE EVALUATED AS SUPERCONDUCTORS. A COPPER MATRIX CONTAINING NIOBIUM-TITANIUM STRANDS BRAIDED TO WIRES AND TWISTED TO CABLES IS A PREFERRED APPROACH AT THIS TIME. STAINLESS STEEL CONDUITS ENCLOSING CABLE BUNDLES ALSO PROVIDE INTERNAL LIQUID HELIUM CHANNELS FOR COOLING ALONG THE LENGTH OF THE CABLES. NO EXTERNAL DEWARS ARE REQUIRED. THE DESIGN OF A LIQUID NITROGEN JACKET AROUND THE CONDUIT AND MULTIPLE INSULATING LAYERS DEPENDS CRITICALLY UPON THE AD COR DC NATURE OF THE POWER CONDUCTED, THE CABLE LENGTHS, POWER LEVELS ACCOMMODATED, AND METHOD OF CABLE DEPLOYMENT. THESE FACTORS WILL BE EVALUATED AND A COMPLETE CABLE CONFIGURATION SPECIFIED IN PHASE I. METHODS OF JOINING BETWEEN CABLE SECTIONS, AND THE SIZE AND DESIGN OF SMALL INTEGRATED REFRIGERATION AND PUMPING PACKAGES SPACED ALONG THE CABLE LENGTH WILL BE ESTABLISHED. MODIFICATIONS IN CABLE DESIGN TO ACCOMMODATE AIR DEPLOYMENT ALSO WILL BE CONSIDERED.

OCEAN & ATOMSPHERIC SCIENCE INC
145 PALISADE ST
DOBBS FERRY, NY 10522
CONTRACT NUMBER:
ROSS E WILLIAMS
TITLE:
INTELLIGENT BUFFER FOR ON-LINE REAL-TIME COMPENSATION
DISTORTIONS
TOPIC# 57 OFFICE: NAVSEA

SUBMITTED BY

A DESIGN APPROACH USING HIGH SPEED MICROPROCESSORS AND RAPID-ACCESS MEMORY DEVICES IS SUGGESTED FOR A STAND-ALONE INTELLIGENT BUFFER THAT INSERTS DELAYS TO COMPENSATE FOR SENSOR POSITION ERRORS IN THE SENSOR DATA STREAM THAT FEEDS A CONVENTIONAL BEAMFORMER IN REAL-TIME. THE MOTOROLA 68020 AND INTEL 80386 32 BIT HIGH SPEED MICROPROCESSOR CHIPS HAVE SEVERAL ATTRACTIVE FEATURES FOR THIS APPLICATION WHEN USED TO CONTROL THE INSERTION AND REMOVAL OF SERIAL SENSOR DATA IN FIFO FASHION FROM VERY FAST RANDOM OR SERIAL ACCESS MEMORY CHIPS. A BLOCK DIAGRAM IS GIVEN FOR THE SYSTEM CONCEPT. A HYPOTHETICAL ARRAY EXAMPLE IS PRESENTED TO ILLUSTRATE DATA RATES, PROCESSING LOAD, AND REAL-TIME CAPABILITY. IN PHASE I, OAS WILL DETERMINE MAXIMUM DELAYS REQUIRED FOR COMPENSATION AND THE NUMBER OF ANGULAR SECTIONS TO BE COMPENSATED. HARDWARE DESIGN ALTERNATIVES WILL BE EVALUATED AND OPTIMUM COMPONENTS SPECIFIED. A TIMING SEQUENCE WILL BE ESTABLISHED FOR ON-LINE OPERATIONS, AND A FLOW DIAGRAM FOR MICROPROCESSOR SOFTWARE WILL BE DEFINED.

OMNI ANALYSIS
9663 TIERRA GRANDE - STE 304
SAN DIEGO, CA 92126
CONTRACT NUMBER:
RICHARD D HASKELL
TITLE:
PROTOTYPE GENERALIZED INTERACTIVE MINEFIELD EVALUATION
TOPIC# 88 OFFICE: NAVSEA

THE PURPOSE OF THE PROPOSED EFFORT IS TO DEMONSTRATE THE FEASIBILITY AND USEFULNESS OF AN INTERACTIVE MINEFIELD EVALUATION PROGRAM WHICH INCORPORATES EXTENSIVE USE OF ENVIRONMENTAL AND TECHNICAL DATA BASES WITH MODERN MINE WARFARE THEORY. THE OBJECTIVE IS TO PROVIDE AN EASILY USED AND MATHEMATICALLY SOUND BASIS FOR MINEFIELD PLANNING AND PROCUREMENT DECISION ANALYSIS. THE PROJECT IS FUNCTIONALLY DIVIDED INTO THREE TASKS; MINEFIELD EVALUATION MODELING, DATA BASE DEFINITION AND PROGRAM ARCHITECTURE. THE MINEFIELD EVALUATION MODELING WILL APPLY CONFIGURED MINEFIELD THEORY TO MULTIPLE MINE TYPES AGAINST MULTIPLE TARGET TYPES IN A NON-HOMOGENEOUS ENVIRONMENT. DATA BASE DEFINITION INCLUDES USE OF EXISTING, USER DEFINED AND PROGRAM GENERATED DATA BASES AS REQUIRED TO SOLVE THE VARIED PROBLEMS OF MINE WARFARE. THE PROGRAM ARCHITECTURE WILL PRODUCE AN EFFICIENT AND

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USER ORIENTED PROGRAM WHICH COMBINES THE MODELS AND DATA BASES TO PROVIDE MEANINGFUL AND UNDERSTANDABLE RESULTS.

OPCOA INC
1201 N BROADWAY
SANTA ANA, CA 92701
CONTRACT NUMBER:
DR WILLIAM H QUICK
TITLE:
AIRCRAFT ENGINE TURBINE INSTRUMENTATION
TOPIC# 229 OFFICE: NAPC/NAVAIR

WITH THE RECENT, RAPID ACCELERATION IN THE GROWTH OF FIBER OPTIC TRANSMISSION SYSTEMS, IT SEEMS LOGICAL THAT ALL-OPTICAL SENSORS WILL BE THE NEXT GENERATION OF SENSORS--NOT JUST FOR TEMPERATURE AND PRESSURE BUT FOR A VARIETY OF PARAMETERS, INCLUDING STRESS, DISPLACEMENT, LIQUID LEVEL, ETC. TO DEMONSTRATE THE OPTICAL SENSOR CONCEPT, A PRESURE SENSOR WILL BE DESIGNED AND FABRICATED FOR APPLICATION IN THE EMP/EMI, HIGH-TEMPERATURE CONDITIONS OF TURBINE ENGINE TEST INSTRUMENTATION. THE SENSOR CONSISTS OF A BROADBAND LIGHT SOURCE COUPLED INTO AN OPTICAL FIBER WHICH TRANSMITS THIS BROADBAND SPECTRUM TO THE REMOTE SENSOR ELEMENT. THE SENSOR ELEMENT IS A VARIABLE GAP FABRY-PEROT CAVITY WHICH MODULATES THE REFLECTED SPECTRUM ACCORDING TO GAP DIMENSION. THE REFLECTED SPECTRUM IS FIBER-TRANSMITTED BACK TO A MICROPROCESSOR BASED, COLOR DEMODULATION SYSTEM. THIS COLOR DEMODULATION IS ACCOMPLISHED BY PRISM DISPERSION OVER A CHARGE-COUPLED-DEVICE (CCD). THE MICROPROCESSOR USES KALMAN FILTERING TO ANALYZE AND CONVERT THE SPECTRAL DATA TO PRESSURE.

OPTELECOM INC
15930 LUANNE DR
GAITHERSBURG, MD 20877
CONTRACT NUMBER:
DR WILLIAM H CULVER
TITLE:
DEVELOPMENT OF LOW COST RPV COMMUNICATIONS PAYLOADS
TOPIC# 83 OFFICE: NAVSEA

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THE PROPOSED PHASE I PROGRAM WILL ANALYZE THE APPLICATION OF TWO NEW COMMUNICATION TECHNOLOGIES ARE (1) PAYING OUT AN OPTICAL FIBER FROM THE RPV AND PROBABLY ALSO SIMULTANEOUSLY FROM A SURFACE SHIP OR SUBMARINE SO AS TO FORM A CONTINUOUS PHYSICAL BI-DIRECTIONAL COMMUNICATION LINK BETWEEN THE RPV AND SHIP, AND (2) USE OF MODULATABLE OPTICAL RETROREFLECTOR MOUNTED ON THE RPV OR RELAY WHICH CAN BE INTERROGATED FROM ONE OR MORE SURFACE SHIPS BY DIRECTING LASERS ON THE SHIPS AT THE RETROREFLECTOR. THE PROGRAM WILL ANALYZE THE APPLICATION OF THESE COMMUNICATION TECHNOLOGIES TO APPLICATIONS AS DEFINED IN CONSULTATION WITH NAVSEA. ONE SUCH SYSTEM WILL BE DESIGNED AND A COST ESTIMATE WILL BE PREPARED FOR A DEMONSTRATION TO BE PERFORMED IN PHASE II OF THIS PROGRAM. BOTH OF THESE TECHNOLOGIES WERE INVENTED AND DEVELOPED AT OPTELECOM.

OPTIVISION INC
2655 PORTAGE BAY AVE
DAVIS, CA 95616
CONTRACT NUMBER:
ALEXANDER A SAWCHUK
TITLE:
DATA SIGNALS CONTROL SIGNALS AND PROTOCOLS FOR FIBER O
CROSSBAR NETWORKS
TOPIC# 104 OFFICE: NAVAIR

THE ADVANTAGES OF OPTICS FOR COMMUNICATIONS AND INTERCONNECTIONS AMONG ELECTRONIC SYSTEMS ARE WELL KNOWN; SEVERAL GROUPS ARE DEVELOPING FIBER OPTIC CROSSBAR NETWORKS HAVING A WIDE VARIETY OF BANDWIDTHS, RECONFIGURATION TIMES, SWITCHING MODES, INSERTION LOSSES, ETC. IN ANY APPLICATION, FIBER OPTIC CROSSBARS MUST INTERFACE RELIABLY AND EFFICIENTLY WITH EXISTING ELECTRONICS. WHILE CURRENT TECHNOLOGY ALLOWS FIBER OPTIC CROSSBAR NETWORKS HAVING GREATER THAN 1 GHz BANDWIDTH ON EACH DATA LINE AND RECONFIGURATION TIMES OF A FEW MICROSECONDS OR LESS, THERE HAS BEEN VERY LITTLE THOUGHT GIVEN TO ELECTRONIC INTERFACE ISSUES. IN THIS PROPOSAL, WE DISCUSS: SYSTEM ISSUES IN DATA SIGNALING (WHAT KIND OF SIGNAL FORMAT, WHERE SHOULD OPTICAL TRANSMITTERS AND RECEIVERS BE PLACED, HOW SHOULD OPTICAL MULTIPLEXERS AND DEMULTIPLEXERS BE USED, HOW CAN ERROR DETECTION AND CORRECTION BE USED); CONTROL SIGNALS (HOW SHOULD THE ELECTRONIC SIGNALS THAT ULTIMATELY DRIVE THE CROSSBAR CONTROLLER BE DERIVED, SHOULD THE NETWORK

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OPERATE IN A CIRCUIT SWITCHED OR PACKET SWITCHED MODE, SHOULD DATA CARRY ROUTING INFORMATION ENCODED AS A HEADER); AND PROTOCOLS (THE PROCEDURES OR ALGORITHMS FOR DATA ROUTING FOR THE MOST EFFICIENT USE OF THE CROSSBAR NETWORK). IN THIS PHASE I SBIR STUDY, WE PROPOSE TO EXAMINE ALL THESE ISSUES AND DERIVE GENERAL SOLUTIONS FOR A WIDE RANGE OF APPLICATIONS OF FIBER OPTIC CROSSBAR NETWORKS IN MILITARY AND INDUSTRIAL ENVIRONMENTS.

OPTIVISION INC
2655 PORTAGE BAY AVE
DAVIS, CA 95616
CONTRACT NUMBER:
ANIL K JAIN
TITLE:
COLOR VIDEO COMPRESSOR FOR TELEMETRY
TOPIC# 168 OFFICE: NWC/NAVAIR

THIS IS A PROPOSAL FOR THE DEVELOPMENT OF A COLOR VIDEO REAL-TIME DATA COMPRESSION SYSTEM. THE PROPOSED SYSTEM WILL CONTAIN A TRANSMITTER AND A RECEIVER. THE TRANSMITTER WILL ACCEPT AN NTSC STANDARD COLOR VIDEO SIGNAL, DIGITIZE IT, COMPRESS IT IN REAL-TIME, AND ENCODE IT FOR TRANSMISSION AT USER-SELECTABLE RATES RANGING FROM 10Mb/S TO 50 Mb/S. THE RECEIVER WILL DECODE AND DECOMPRESS THE DIGITAL BIT STREAM AND RECONSTRUCT THE DIGITIZED VIDEO SIGNAL FOR DISPLAY. THE PROPOSED PHASE I STUDY WILL RESULT IN A RECOMMENDED COMPRESSION ALGORITHM THAT HAS BEEN OPTIMIZED FOR i) RATE VERSUS SUBJECTIVE VISUAL QUALITY, ii) TELEMETRY CHANNEL ERROR EFFECTS, AND iii) OTHER CONSTRAINTS RELATED TO REAL TIME OPERATION, SIZE, POWER, MECHANICAL AND ELECTRICAL INTERFACE REQUIREMENTS. PHASE I RESULTS WILL BE ACCOMPANIED BY A SYSTEM-LEVEL HARDWARE ARCHITECTURE AND COMPUTER SIMULATION RESULTS. PHASE II WILL RESULT IN THE FABRICATION OF A PROTOTYPE SYSTEM FOR REAL-TIME DEMONSTRATION.

OPTOMEC DESIGN CO
PO BOX 619
LOS ALAMOS, NM 87544
CONTRACT NUMBER:
THOMAS A SWANN
TITLE:
ROTARY JOINT FOR SINGLE-MODE OPTICAL FIBER
TOPIC# 237 OFFICE: NOSC/NAVSEA

SUBMITTED BY

FIBER OPTIC TECHNOLOGY IS DISPLACING ELECTRICAL WIRINC IN MANY APPLICATIONS. THE TREND IN FIBER OPTICS IS CLEARLY TOWARDS THE SINGLE-MODE TYPE VERSUS THE MULTIMODE TYPE. THIS PRESENTS A PROBLEM IN BUILDING COUPLINGS FOR SINGLE MODE FIBERS, SIMPLY BECAUSE THE CORES ARE MUCH SMALLER IN DIAMETER NECESSITATING TIGHTER ALIGNMENT AND STABILITY REQUIREMENTS. A ROTARY JOINT FOR 50 MICRON CORE MULTIMODE FIBERS HAS BEEN SUCCESSFULLY DEVELOPED. THIS MULTIMODE DESIGN CONSISTS OF A PAIR OF GRADIENT INDEX ROD LENSES MOUNTED SO THAT THE PLANE OF ROTATION OCCURS BETWEEN THE LENSES. THE MAJOR PROBLEM THAT ARISES IN ADAPTING THIS DESIGN FOR SINGLE-MODE FIBERS IS THE ALIGNMENT AND FIXING IN PLACE OF THE FIBER WITH RESPECT TO THE LENS. OPTOMEC SEES AN OPPORTUNITY HERE TO APPLY ITS EXPERIENCE IN THE DESIGN OF FIBER OPTIC FUSION SPLICERS, TO DEVELOP HARDWARE AND TECHNOLOGY THAT COULD BE USED TO FUSE THE SINGLE-MODE FIBER ONTO THE LENS, WHICH WOULD ASSURE THAT THE ALIGNED RELATIONSHIP BETWEEN THE FIBER AND THE LENS IS RETAINED. THE PHASE I TECHNICAL OBJECTIVE OF THIS PROJECT IS TO DEVELOP A TECHNIQUE FOR FUSION BONDING SINGLE-MODE OPTICAL FIBERS TO ROD LENSES.

ORINCON CORP
3366 N TORREY PINES CT - STE 300
LA JOLLA, CA 92037
CONTRACT NUMBER:
DR GERALD M ANDERSON
TITLE:
A MORE EFFECTIVE NAVIGATION MODEL FOR INTERDICTIONS OF TARGETS
TOPIC# 65 OFFICE: NAVSEA

GUIDANCE OR NAVIGATION LAWS FOR ANTI-TORPEDO WEAPONS MUST BE EFFECTIVE AGAINST HIGHLY MANEUVERABLE TARGETS. CLASSICAL GUIDANCE LAWS, SUCH AS PROPORTIONAL NAVIGATION, DO NOT SATISFY THIS CRITERION SINCE THEIR DESIGN IS BASED ON THE ASSUMPTION OF A NONMANEUVERING TARGET. GUIDANCE LAWS BASED ON DIFFERENTIAL GAME THEORY SPECIFICALLY ACCOUNT FOR THE MANEUVER CAPABILITIES OF THE TARGET. THE OBJECTIVES OF THIS PROJECT ARE (1) TO USE ZERO-SUM DIFFERENTIAL GAME THEORY TO DERIVE GUIDANCE LAWS FOR ANTI-TORPEDO WEAPONS AND (2) TO EVALUATE THEM USING A SIMULATION. THESE LAWS WILL CONSIDER THE TIME DELAY AND UNCERTAINTIES IN THE ACOUSTIC DATA THAT PROVIDE THE INFORMATION ON

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RELATIVE TARGET MOTION. WORK WILL START WITH DEVELOPMENT OF DYNAMIC MODELS FOR THE TWO VEHICLES, THE ACOUSTIC MEASUREMENT MODEL FOR THE ANTI-TORPEDO WEAPON, AND THE WEAPON'S MEASUREMENT OF PERFORMANCE. DIFFERENTIAL GAME THEORY WILL BE USED TO DERIVE THE GUIDANCE LAWS CONSIDERING THE DELAY IN THE RECEIPT OF ACOUSTIC DATA ON THE TARGET DUE TO THE FINITE SPEED OF SOUND, FIRST ASSUMING PERFECT TARGET INFORMATION AND THEN INCLUDING THE NOISY ACOUSTIC MEASUREMENT MODELS. A POINT MASS SIMULATION WILL BE DEVELOPED AND USED TO COMPARE THE PERFORMANCE OF THESE GUIDANCE LAWS AGAINST BOTH CLASSICAL AND OPTIMAL CONTROL GUIDANCE LAWS.

ORTEL CORP
2015 W CHESTNUT ST
ALHAMBRA, CA 91803
CONTRACT NUMBER:
DR ISRAEL URY
TITLE:
PIGTAILED SINGLE MODE LASER DIODES
TOPIC# 51 OFFICE: NAVSEA

COST REDUCTION IN THE MANUFACTURING OF MAKING PIGTAILED SINGLEMODE LASER DIODES. ORTEL PROPOSES A TWO-FOLD APPROACH UTILIZING AN INNOVATIVE CLOSED LOOP POSITIONING SYSTEM FOR COUPLING/POSITIONING THE SINGLEMODE FIBER PIGTAIL. THIS WILL BE COMBINED WITH A NEW MECHANICAL DESIGN FOR LASER WELDING THE FIBER AFTER POSITIONING.

OSBORNE A ASSOCS INC
756 LAKEFIELD RD - BLDG J
WESTLAKE VILLAGE, CA 91361
CONTRACT NUMBER:
ANDREW BAZELEY
TITLE:
WATERSIDE SECURITY ROBOTICS
TOPIC# 235 OFFICE: NOSC/NAVSEA

THE OBJECTIVE OF THIS RESEARCH PROJECT IS TO DEVELOP THE TECHNICAL SPECIFICATION FOR A ROBOT BASED SUBSEA SECURITY SYSTEM CAPABLE OF EFFECTIVELY PROTECTING WATERSIDE FACILITIES AND VESSELS FROM ALL

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PERCEIVED WATERBORNE THREATS. EFFECTIVE PROTECTION ENTAILS THE REDUCTION OF WATERSIDE SECURITY BREACHES, AND THE DETECTION, IDENTIFICATION AND NEUTRALIZATION OF ANY WATERBORNE INTRUDER OR THREAT AT SUFFICIENT RANGE SO AS NOT TO JEOPARDIZE THE FACILITY OR VESSEL. IN ORDER TO SPECIFY THE SYSTEM PERFORMANCE REQUIREMENTS, AN ACCURATE DEFINITION WILL FIRST BE MADE OF THE TARGETS AND THEIR VULNERABILITY AS WELL AS THE WORST CASE WATERBORNE THREATS, BE THEY SWIMMERS, VEHICLES, ROBOTS, MINES OR MAMMALS. THE TECHNICAL SPECIFICATION DEVELOPED WILL ACCURATELY DESCRIBE THE MECHANICAL, ELECTRONIC, HYDRODYNAMIC AND CONTROL SYSTEM CHARACTERISTICS OF A SUITABLE SUBSEA ROBOT. IT WILL ALSO DESCRIBE THE SENSORY DEVICES, ACOUSTIC, VIDEO AND OTHERS, TO BE CARRIED BY THE ROBOT VEHICLE AND WHICH ARE REQUIRED FOR THE DETECTION AND IDENTIFICATION OF WATERBORNE INTRUDERS.

PACER SYSTEMS INC
900 TECHNOLOGY PARK DR
BILLERICA, MA 01821
CONTRACT NUMBER:
JOHN A BRINK
TITLE:
CHEMICAL BIOLOGICAL AND RADIOLOGICAL DEFENSE TRAINING
TOPIC# 222 OFFICE: NPRDC/ONT

THE CURRENT EQUIPMENT AND TECHNIQUES EMPLOYED BY UNITED STATES MILITARY FORCES IN RESPONSE TO ACTUAL OR THREATENED CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL (CBR) WARFARE LIMIT ONE'S ABILITY TO PERFORM ESSENTIAL FUNCTIONS. DURING PRIOR RESEARCH, TASKS CRITICAL TO CONTINUED OPERATIONS IN A CBR ENVIRONMENT HAVE BEEN IDENTIFIED. PACER SYSTEMS, INC. WILL REVIEW THIS WORK TO DETERMINE, TOOLS AND/OR PROCEDURES TO OVERCOME THESE OBSTACLES WILL BE INVESTIGATED. FINALLY, EXPERIMENTS WILL BE DESIGNED AND CONDUCTED IN ORDER TO DETERMINE WHICH SPECIAL TOOLS OR TRAINING AIDS WOULD PRESEBT A VIABLE SOLUTION TO THE PROBLEMS PRESENTED BY A CBR CONTAMINATED ENVIRONMENT.

PDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
DR JOSEF E WUERER
TITLE:
TRAILING WIRE ANTENNA ICING
TOPIC# 107 OFFICE: NAVAIR

SUBMITTED BY

ISCE ACCUMULATION ON THE TRAILING WIRE ANTENNA WILL CHANGE ITS AERODYNAMIC TOW CHARACTERISTICS. IN GENERAL, IT CAUSES INCREASED DRAG, CHANGES THE DEPLOYED WIRE SHAPE AND CAN AFFECT THE DYNAMIC STABILITY OF THE CABLE. IF ICE BUILD-UP IS NOT CONTROLLED, IT CAN LEAD TO TENSION FAILURE OF THE WIRE AND/OR ALTER THE ELECTROMAGNETIC PERFORMANCE OF THE ANTENNA. THE PROBLEM IS PARTICULARLY SEVERE IN MARINE ENVIRONMENTS AND FOR MISSIONS REQUIRING A CONTINUOUS AIRCRAFT BANKING TURN SINCE THIS POTENTIALLY PROLONGS EXPOSURE TO SUPERCOOLED CLOUDS. THE PRIMARY THRUST OF THE PROPOSED PROGRAM IS TO DEVELOP A COMPUTATIONAL FRAMEWORK THAT PROPERLY ACCOUNTS FOR THE RELATIONSHIP BETWEEN ICE ACCUMULATION ON THE TRAILING WIRE AND THE WIRE TOWING DYNAMICS. VARIOUS TECHNIQUES FOR CONTROLLING ICE FORMATION WILL BE EVALUATED. EXPERIMENTAL PLANS WILL BE DEVELOPED TO DEMONSTRATE THE VALIDITY OF THE ANALYTICAL TOOLS AND THE EFFECTIVENESS OF ICE BUILD-UP CONTROL TECHNIQUES.

PDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
HUGH O PIERSON
TITLE:
CHEMICAL VAPOR DEPOSITION PROCESSES FOR CERAMIC COATIN
TITANIUM AND TITANIUM ALLOYS
TOPIC# 119 OFFICE: NSWC

TITANIUM HAS A UNIQUE COMBINATION OF THERMOPHYSICAL PROPERTIES WHICH RESULT IN OXIDATION SUSCEPTIBILITY. A NUMBER OF COATINGS HAVE BEEN DEVELOPED FOR TITANIUM TO IMPROVE ITS OXIDATION RESISTANCE. COATING PROCESSES FOR TITANIUM PRESENT A VARIETY OF PROBLEMS AND ALL POSSESS LIMITATIONS. CHEMICAL VAPOR DEPOSITION (CVD) PROCESSES HAVE EXCELLENT POTENTIAL TO DEVELOP UNIFORM COATINGS ON COMPLEX GEOMETRIES. CURRENT CVD PROCESSES TO PRODUCE TITANIUM CARBIDE OR TITANIUM DIBORIDE, WHICH ARE COATING CANDIDATES FOR TITANIUM, INVOLVE REACTION TEMPERATURES ABOVE THE PHASE TRANSFORMATION TEMPERATURE OF TITANIUM AND EXPOSE TITANIUM TO ATTACK BY HYDROGEN AND CHLORINE. LOW TEMPERATURE CVD PROCESSES FOR THE FORMATION OF TITANIUM CARBIDE AND TITANIUM DIBORIDE ARE PROPOSED FOR INVESTIGATION. ALL REACTIONS PROPOSED ARE BELOW THE PHASE TRANSFORMATION TEMPERATURE OF TITANIUM.

SUBMITTED BY

SEVERAL ARE BELOW THE CRITICAL TEMPERATURE FOR THE ONSET OF HYDROGEN REACTIVITY. ALL APPEAR CAPABLE OF DEVELOPING CARBIDE AND DIBORIDE COATINGS WITH EXCELLENT OXIDATION, CHEMICAL AND WEAR RESISTANCE.

FDA ENGINEERING
2975 RED HILL AVE
COSTA MESA, CA 92626
CONTRACT NUMBER:
JAMES R CARLUCCIO
TITLE:
EVALUATION OF A MMC WING FOR THE SPARROW
TOPIC# 213 OFFICE: PMTC/NAVAIR

A NEW LOW COST CASTING METHOD HAS BEEN DEVELOPED TO PRODUCE SILICON/ CARBIDE ALUMINUM (SiC/Al) WITH INEXPENSIVE RAW MATERIALS AND CONVENTIONAL FOUNDRY TECHNIQUES. LIMITED MATERIAL TESTS AND COST PROJECTIONS INDICATE THAT SiC/Al POSSES MANY CHARACTERISTICS THAT MAKE IT A DESIRABLE MATERIALS ALTERNATIVE TO TITANIUM ALLOYS FOR MANY APPLICATIONS. RELATIVE TO COMMONLY UTILIZED TITANIUM ALLOYS, INCREASES IN SPECIFIC STIFFNESS OF 50 PERCENT WITH COMPARABLE SPECIFIC STRENGTH CAN BE OBTAINED. LIMITED HIGH TEMPERATURE TESTING HAS REVEALED THAT HIGH TEMPERATURE STRENGTH AND STIFFNESS IMPROVEMENTS ARE POSSIBLE WHILE EXTENDING THE OPERATING RANGE OF THE BASE ALLOY UP TO 100 DEG F. ONE APPLICATION IN WHICH CAST SiC/Al HAS POTENTIAL BENEFITS IS IN THE FABRICATION OF WINGS AND/OR FINS OF THE SPARROW. THIS LOW COST PROCESS OF METAL MATRIX FABRICATION COULD PRODUCE WINGS OR FINS THAT HAVE SUFFICIENT STRENGTH AND RIGIDITY TO MEET DESIGN REQUIREMENTS WHILE PROVIDING SUBSTANTIAL COST BENEFITS OVER MATERIALS SUCH AS TITANIUM. AN ANALYTICAL EVALUATION OF A CAST SiC/Al SPARROW WING WILL BE CONDUCTED. ANALYSES WILL INCLUDE A THERMAL RESPONSE ASSESSMENT, MODAL AND FLUTTER ANALYSES AND A STRUCTURAL RESPONSE ANALYSIS. IN ADDITION, A SMALL CASTING DEVELOPMENT PROGRAM WILL BE CONDUCTED TO DEMONSTRATE THE ABILITY OF FABRICATING A COMPONENT, SUCH AS A SPARROW WING FROM CAST SiC/Al.

PHILLIPS ENGINEERING CO
721 PLEASANT ST
ST JOSEPH, MI 49085
CONTRACT NUMBER:
B A PHILLIPS
TITLE:
FREON ABSORPTION AIR CONDITIONING
TOPIC# 244 OFFICE: DTNSRDC

SUBMITTED BY

THE PURPOSE OF THIS PROJECT IS TO INVESTIGATE THE APPLICABILITY TO NAVAL SHIPS OF RECENT DEVELOPMENTS IN ABSORPTION AIR CONDITIONING USING FLUOROCARBON REFRIGERANTS AND ORGANIC ABSORBENTS AS THE WORKING FLUIDS. THE INVESTIGATION WILL REVIEW THE WORK IN THE FLUOROCARBON ABSORPTION FIELD DURING THE LAST 20 YEARS WORLD WIDE. THE MANY COMBINATIONS OF FLUOROCARBON REFRIGERANTS AND ORGANIC ABSORBENTS ARE TO BE EVALUATED, AS ARE THE VARIOUS ABSORPTION CYCLES, JUDGING THEM FOR USABILITY AND POSSIBLE ADVANTAGES ON NAVAL VESSELS. IF FURTHER ADVANCES OR IMPROVEMENTS ARE FOUND TO BE NEEDED TO MEET NAVAL REQUIREMENTS ATTEMPTS WILL BE MADE TO DEVISE DIRECTIONS TO BE FOLLOWED IN FUTURE RESEARCH AND DEVELOPMENT. THE PROBABILITIES OF SUCCESS IN THOSE EFFORTS WILL BE ESTIMATED.

PHOTON SCIENCES (OLD: FLOW RESEARCH CO)
21414 - 68TH AVE
KENT, WA 98032
CONTRACT NUMBER:
DR BRIAN W WALKER
TITLE:
MINIATURIZED MAGNETIC SENSOR
TOPIC# 80 OFFICE: NAVSEA

A NOVEL MINIATURIZED MAGNETIC SENSOR IS PROPOSED WHICH OPERATES ON A MOLECULAR LEVEL. RATHER THAN USING A MAGNETIC FIELD TO MODULATE CONDUCTIVITY OR CURRENT FLOW, THE PROPOSED SENSOR MODULATES OPTICAL TRANSMISSION. THE MAGNETIC RESPONSE OF A LIQUID CRYSTALLINE MEDIUM IS GREATLY INCREASED BY THE ADDITION OF CERTAIN SMALL PARTICLES. IN THE LIQUID CRYSTAL MEDIUM THESE PARTICLES SPONTANEOUSLY ALIGN TO FORM SMALL CHAINS. THE MOTION OF THESE CHAINS AFFECTS THE LIQUID CRYSTAL OPTICAL PROPERTIES. THE DEVICE, TO A CERTAIN EXTENT, MIMICS BACTERIA WHICH SENSE THE DIRECTION OF THE EARTH'S MAGNETIC FIELD. THE EFFECT OF THE MAGNETIC FIELD ON THE COMPOSITE OPTICAL MEDIUM CAN BE COUNTERBALANCED BY AN ELECTRIC FIELD SUCH THAT NO CHANGE IN OPTICAL PROPERTIES TAKES PLACE. THE VOLTAGE NECESSARY TO MAINTAIN THIS BALANCE IS A DIRECT MEASURE OF THE MAGNETIC FIELD STRENGTH. BECAUSE OF THIS BALANCING MECHANISM, THE MEASURED MAGNETIC FIELD STRENGTHS CAN BE QUITE LARGE OR SMALL, AND INTERFEROMETRIC METHODS CAN BE APPLIED TO ACHIEVE VERY HIGH SENSITIVITIES. FABRICATION IS COMPATIBLE WITH CURRENT INTEGRATED CIRCUIT AND MICROMINIATURIZATION TECHNOLOGIES.

SUBMITTED BY

PHYSICAL DYNAMICS INC
PO BOX 1883
LA JOLLA, CA 92038
CONTRACT NUMBER:
DR WALTER N PODNEY
TITLE:
PULSED ELECTROMAGNETIC SYSTEM FOR AIRBORNE SURVEILLANC
IN SHALLOW WATER
TOPIC# 89 OFFICE: NAVSEA

A REVIEW OF SENSOR TECHNOLOGIES SHOWS THAT ELECTROMAGNETIC ENERGY AT FREQUENCIES BELOW 1 kHz CAN PROVIDE A RELIABLE MEANS TO DETECT, IDENTIFY, AND LOCATE MINES IN SHALLOW WATER. A PULSED ELECTROMAGNETIC INSTRUMENT COMPRISING A TRANSMITTER ENCIRCLING A SUPERCCNDUCTIVE MAGNETIC RECEIVER PROMISES TO PROVIDE AN AIRBORNE SYSTEM CAPABLE OF RAPIDLY LOCATING MINES. ELECTRIC CURRENT PULSES IN THE TRANSMITTER ILLUMINATE TARGETS. THE INSTRUMENT CAN PROVIDE THE ANALOGUE OF RADAR AT FREQUENCIES LOW ENOUGH TO PENETRATE SEAWATER OF DEPTH "10 M. FIRST ESTIMATES SHOW THAT A PRACTICAL TRANSMITTER MOMENT, "10,000 A M2, CAN GIVE USEFUL SWEEP RATES AT A TOW SPEED OF >200 KNOTS FOR A PATH WIDTH EXCEEDING 30 M. WE PROPOSE BOTH ANALYSES AND FIELD MEASUREMENTS WITH A PROTOTYPE INSTRUMENT TO VERIFY THE FEASIBILITY OF OPERATING A SUPERCONDUCTIVE GRADIOMETER WITHIN A PULSATING ELECTRIC CURRENT AND TO DETERMINE EXPECTED INSTRUMENT PERFORMANCE.

PHYSICAL DYNAMICS INC
PO BOX 1883
LA JOLLA, CA 92038
CONTRACT NUMBER:
WALTER N PODNEY
TITLE:
MAGNETIC SYSTEM FOR LAUNCH TUBE LINEAR POSITION MEASUR
TOPIC# 177 OFFICE: NWC/SSPO

A MEANS IS REQUIRED TO MEASURE THE CLEARANCE BETWEEN THE SURFACE OF A MISSILE AND ITS LAUNCH TUBE DURING A LAUNCH, TO AN ACCURACY OF THE ORDER OF 2%. THE MEASUREMENT MUST REMAIN UNPERTURBED BY LARGE

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FLUCTUATIONS IN ENVIRONMENTAL TEMPERATURE, AND IN THE DENSITY AND ELECTRICAL CONDUCTIVITY OF THE GASES IN THE TUBE DURING LAUNCH. A REVIEW OF MEASURMENT TECHNOLOGIES SUGGESTS THAT A MAGNETIC SCHEME IS MOST LIKELY TO SATISFY ALL REQUIREMENTS. SMALL BEADS OF A HARD PERMANENT MAGNETIC MATERIAL (SUCH AS SmCo5) ARE MOUNTED IN A DISTINCTIVE PATTERN ON THE MISSILE SKIRT. A MAGNETIC SENSOR OF SUFFICIENT LOW-FREQUENCY SENSITIVITY MEASURES THE MAGNETIC FIELD OF THE BEADS AS THE MISSILE PASSES BY. THE FIELD AMPLITUDE IS STRONGLY DEPENDENT UPON THE RANGE BETWEEN THE MAGNETIC SOURCE AND SENSOR. FOR PHASE I WE PROPOSE TO TEST ANALYTICAL CALCULATIONS OF SYSTEM PERFORMANCE BY CONSTRUCTING A MOCKUP TEST BED AND PERFORMING A SERIES OF MAGNETIC MEASUREMENTS AS A FUNCTION OF RANGE AND SPEED DOWN THE TUBE.

PHYSICAL SCIENCES INC
PO BOX 3100 - RESEARCH PK
ANDOVER, MA 01810
CONTRACT NUMBER:
MICHAEL B FRISH
TITLE:
VOLUMETRIC MEASUREMENT OF LOCAL VORTICITY VECTORS BY O
TOPIC# 9 OFFICE: ONR

THE VORTICITY OPTICAL PROBE (VOP) IS A RECENTLY DEVELOPED TECHNIQUE WHICH USES MICROSCOPIC CLEAR SPHERICAL PARTICLES CONTAINING EMBEDDED PLANAR REFLECTIVE CRYSTALS TO SAMPLE THE LOCAL VORTICITY OF A LIQUID FLOW IN WHICH THEY ARE SUSPENDED. LASER LIGHT REFLECTIONS FROM THE PARTICLES, DETECTED EXTERNALLY TO THE FLOW, HAVE BEEN USED IN THE PAST TO DETERMINE ONE OR TWO COMPONENTS OF A SINGLE SPHERE'S ANGULAR VELOCITY SECTOR, WHICH IS EQUAL TO HALF THE LOCAL VORTICITY. WE PROPOSE TO DEVELOP OPTICAL TECHNIQUES WHICH WILL ENABLE SIMULTANEOUS MEASUREMENT OF ALL THREE VORTICITY COMPONENTS AT MANY IDENTIFIABLE POINTS OVER A LARGE VOLUME OF THE FLOWFIELD. SIMULATIONS OF ROTATIONAL FLOWS WILL BE USED TO EVALUATE THE FEASIBILITY OF THE PROPOSED APPROACH.

PLANNING SYSTEMS INC
95 TRUMBULL ST - STE B/FOSS BLDG
NEW LONDON, CT 06320
CONTRACT NUMBER:
JAMES W FITZGERALD
TITLE:
LOW FREQUENCY UNDERWATER SOUND CALIBRATION SOURCE
TOPIC# 60 OFFICE: NAVSEA

SUBMITTED BY

A NEW AND PROPRIETARY LOW-FREQUENCY CERAMIC SONAR PROJECTOR ELEMENT HAS BEEN DEVELOPED, BASED ON A MODIFIED FLEXURE BAR, AND TERMED A FITZGERALD FLEXBAR. A REPRESENTATIVE DESIGN IS SHOWN FOR A FLEXDUCER CONSISTING OF 4 FLEXBARS ENCAPSULATED INTO A HOUSING 3-1/2"D X 18"H WITH A NOMINAL RESONANT FREQUENCY OF ~210 Hz WHEN LOADED IN WATER. BASED ON EQUIVALENT CIRCUIT CALCULATIONS, IT IS SHOWN THAT Qm~25 AND THAT THE MAXIMUM (STRESS LIMITED) OUTPUT IS OF THE ORDER OF ~3 ACOUSTIC WATTS. WITH AN APPROPRIATE EQUALIZING NETWORK, THE FLEXDUCER WOULD BE CAPABLE OF 1 ACOUSTIC WATT OUTPUT OVER A FREQUENCY BAND OF ~165 Hz TO ~265 Hz. MECHANO-ACOUSTIC EFFICIENCIES OF ~75% ARE EXPECTED. FOR DEEP-WATER OPERATIONS (~500 FT.) PRESSURE EQUALIZATION WOULD BE ACHIEVED BY MEANS OF A DOUBLE-STAGE REGULATOR AND A PRESSURIZED AIR TANK.

PLANNING SYSTEMS INC
95 TRUMBULL ST - STE B/FOSS BLDG
NEW LONDON, CT 06320
CONTRACT NUMBER:
JAMES W FITZGERALD
TITLE:
VERY-LOW-FREQUENCY HIGH-POWER SONAR PROJECTOR
TOPIC# 61 OFFICE: NAVSEA

A VLF HIGH-POWERED BROADBAND SOURCE FOR ACTIVE SURVEILLANCE IS PROPOSED, BASED ON A NOVEL, PROPRIETARY TRANSDUCER ELEMENT: VIZ, A MODIFIED FLEXURE BAR WITH AN ELECTRODYNAMIC DRIVE AND TERMED A FITZ-GERALD FLEXBAR. THE COMBINATION OF THE FLEXBAR PRINCIPLES (INCLUDING TRUE NODAL MOUNTS) TOGETHER WITH A NEW HIGH PERFORMANCE MAGNETIC MATERIALS (E.G., SAMARIUM COBALT AND NEODYMIUM) MEANS THAT ELECTRO-MECHANICAL COUPLING COEFFICIENTS OF ~0.6 CAN PROBABLY BE ACHIEVED. THE FLEXBARS ARE ARRANGED IN A CYLINDRICAL CONFIGURATION, WITH THE CYLINDER INTERIOR ACTING AS A HELMHOLTZ RESONATOR. IT IS SHOWN THAT, WITH THE PROPER SELECTION OF DESIGN PARAMETERS, SOURCE LEVELS OF 190-230 dB RE 1 MICRO Pa AT 1 METER CAN PROBABLY BE ACHIEVED OVER THE FREQUENCY RANGE OF 5-40 Hz. TO DEMONSTRATE FEASIBILITY AND ESTABLISH A TECHNOLOGY BASE, IT IS PROPOSED TO FIRST DEVELOP A SMALLER PROJECTOR MODULE, SCALED-UP IN FREQUENCY BY A FACTOR OF 4; I.E., A THREE OCTAVE BAND OF 20-160 Hz. PHASE-I WOULD BE PRIMARILY CONCERNED WITH TRANSDUCER ELEMENT DEVELOPMENT. PHASE-II WOULD BE DIRECTED

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TOWARD DESIGNING, FABRICATING, AND TESTING A FREQUENCY SCALED (X4) PROJECTOR MODULE. BASED ON THE PERFORMANCE OF THE SCALED MODEL, A FULL-SIZED PROJECTOR MODULE IS PROPOSED TO BE CONSTRUCTED IN PHASE III.

PLANNING SYSTEMS INC
7900 WESTPARK DR - STE 600
McLEAN, VA 22102
CONTRACT NUMBER:
GEORGE B DOWLING
TITLE:
WATERSIDE SECURITY ROBOTICS: A CONCEPTUAL SYSTEM FEAS
TOPIC# 235 OFFICE: NOSC/NAVSEA

WATERBORNE INTRUDER DETECTION AND NEUTRALIZATION SYSTEMS HAVE BEEN UNABLE TO KEEP PACE WITH THE TECHNOLOGICALLY ADVANCED WEAPONRY AND OFFENSIVE SYSTEMS NOW AVAILABLE TO ATTACKING SWIMMERS. OF THE MANY FACTORS CONTRIBUTING TO THE LACK OF PROGRESS IN ADDRESSING THIS CRITICAL SHORTFALL, TWO SERIOUS PROBLEMS OFTEN OCCUR IN MANY APPROACHES. FIRST, THE DEGRADING EFFECTS OF ENVIRONMENT AND THE GROSSLY DISSIMLAR CONDITIONS PREVAILING AT DIFFERENT LOCATIONS, IMPOSE A COMPLEX AND EXCEEDINGLY VARYING SET OF SYSTEM REQUIREMENTS. SECONDLY, THE CONTINUOUS, BROAD COVERAGE REQUIRED TO INSURE SECURITY, AS WELL AS THE LACK OF AUTOMATED ALARMS, LEAD TO A VARIETY OF DETECTION GAPS AND HEAVY DEPENDENCE ON TRAINED SENTRIES. THIS RESEARCH IS PROPOSED TO INVESTIGATE, STUDY AND REPORT NEW TECHNIQUES AND TECHNOLOGIES WHICH APPLY TO THE DEVELOPMENT OF A CONCEPTUAL ROBOTIC SYSTEM TO DETECT, ASSESS AND RESPOND TO WATERBORNE INTRUDERS. PSI WILL ADDRESS THIS PROBLEM THROUGH A SERIES OF TASKS DESIGNED TO CHART THE COURSE FOR FUTURE DEVELOPMENT OF A FEASIBLE COST EFFECTIVE WATERSIDE SECURITY ROBOTIC SYSTEM. THIS EFFORT WILL UTILIZE OUR AVAILABLE DATA AND EXPERTISE IN ROV TECHNOLOGY, INTRUDER DETECTION SENSORS, OPERATIONAL SCENARIOS, REAL WORLD ENVIRONMENTAL SITUATIONS AND LIMITATIONS INTRUSION SIMULATION MODELING, AND COUNTERMEASURE RESISTANCE.

POWERTRONIC SYSTEMS INC
PO BOX 29109
NEW ORLEANS, LA 70189
CONTRACT NUMBER:
CHARLES E THOMAS
TITLE:
ELECTRICAL FAULT CURRENT LIMITER
TOPIC# 15 OFFICE: ONT/DTRC

SUBMITTED BY

THE OBJECTIVE OF PHASE I IS TO DETERMINE BY AN ANALYTICAL STUDY THE OPTIMUM DESIGN APPROACH, OR APPROACHES, FOR SOLID-STATE ELECTRICAL FAULT CURRENT LIMITERS FOR THE CURRENT RANGE OF 15 TO 5000 AMPERES. THE ANALYTICAL TRADEOFF STUDY WILL INCLUDE THE FOLLOWING TASKS: 1) DEFINITION OF CURRENT LIMITER REQUIREMENTS, 2) DEFINITION OF TRADEOFF ANALYSIS CRITERIA, 3) DEFINITION OF CANDIDATE CURRENT LIMITER DESIGNS, 4) DEFINITION OF CHARACTERISTICS OF CANDIDATE CURRENT LIMITERS, 5) EVALUATION OF CHARACTERISTICS OF CANDIDATE CURRENT LIMITERS, AND 6) REPORT PREPARATION. IT IS ANTICIPATED THAT GENERAL REQUIREMENTS WILL BE BASED ON SPECIFICATION MIL-E-917, AND THAT SPECIFIC REQUIREMENTS WILL BE DEFINED FOR SEMICONDUCTOR APPLICATION AND FUNCTIONAL CHARACTERISTICS. THE EXPECTED TRADEOFF CRITERIA ARE CHARACTERISTICS SUCH AS SIZE, WEIGHT, COST, OPERATING TIME AND RELIABILITY. CANDIDATE DESIGNS ARE EXPECTED TO BE BASED ON SOLID-STATE POWER SWITCHING CIRCUITS THAT UTILIZE BIPOLAR TRANSISTORS, FIELD EFFECT TRANSISTORS, OR GATE-TURN-OFF SILICON CONTROLLED RECIFIERS. PRELIMINARY DESIGNS WILL BE DETAILED TO THE EXTENT NECESSARY TO DEFINE CHARACTERISTICS OF TRADEOFF CRITERIA. THE REPORT WILL INCLUDE THE RESULTS OF ALL PHASE I TASKS INCLUDING ANALYSIS OF CANDIDATE CHARACTERISTICS.

PRISMOID OPTICAL
RTE 2 - BOX 151
MAPLE LAKE, MN 55358
CONTRACT NUMBER:
RICHARD VIZENOR
TITLE:
OPTICAL DESIGN INNOVATIONS FOR AIRCREW DISPLAY AND TES
TOPIC# 259 OFFICE: NAVAIR/NATC

THIS PROJECT WILL INVESTIGATE DIFFERENT AND UNUSUAL METHODS OF COMBINING OPTICAL POWER WITHIN THE SPLITTER PLATE. SUCH ACCOMPLISHMENTS WOULD SAVE WEIGHT, MINIMIZE VOLUME AND EXTEND A DESIGN DEGREE OF FREEDOM. SEVERAL CONCEPTS HAVE BEEN PROPOSED. THESE WILL BE DESIGNED, FABRICATED AND TESTED. LOW COST METHODS OF PRODUCING SPHERIC SURFACES ON HELMET VISORS WILL ALSO BE INVESTIGATED.

PROGRAMMATICS INC
1850 SAMUEL MORSE DR - STE 220
RESTON, VA 22090
CONTRACT NUMBER: M00027-87-C-0086
ANDREW SNOW
TITLE:
PROVIDING A FOUNDATION FOR USMC COMMUNICATIONS ELECTRO
TOPIC# 24 OFFICE: MARINE CORPS

SUBMITTED BY

GIVEN A LARGE SET OF SITES EACH CONTAINING A UNIQUE SET OF HIERARCHICAL INTERRELATED DATA ELEMENTS, TAKING INTO ACCOUNT THE FREQUENCY AND ELEMENT OCCURENCE AND THEIR RELATIVE IMPORTANCE, A METHODOLOGY IS PROPOSED TO CONSTRUCT A STRATIFIED PROFILE THAT REFLECTS THE RELATIVE IMPORTANCE FOR EACH CLASS IN THE HIERARCHY BASED ON THE TOTAL POPULATION. IN ADDITION, BY EXAMINING THE DATA ELEMENTS, ARCHETYPE SITES AND THEIR STRATIFIED PROFILE CHARACTERISTICS CAN BE DERIVED. SPECIFIC APPLICATION: THE POPULATION OF USMC BASES AND STATIONS ARE POSTULATED TO BE VERY DIVERSE, IN TERMS OF COMMUNICATIONS SERVICES, SYSTEMS, UTILITIES AND FUNCTIONS. A TRAINING PROGRAM IS REQUIRED THAT TAKES THESE FACTORS INTO ACCOUNT. THE ABOVE METHODOLOGY IS PROPOSED TO PROVIDE COURSE PROFILES BASED ON THE FREQUENCY AND IMPORTANCE OF MISSION ELEMENTS. THE RESULTANT PROFILES WOULD PROVIDE A TRAINING DEVELOPER THE RELATIVE EMPHASIS REQUIRED FOR A TRAINING PROGRAM. PHASE I CONCENTRATES ON EXAMINING THE FEASIBILITY OF THE ABOVE APPROACH TO BE APPLIED TO THIS SPECIFIC APPLICATION, IN TERMS OF PROBLEM CHARACTERIZATION, SURVEY FEASIBILITY, ANALYTIC CONSIDERATIONS AND A TEST OF A PROTOTYPE QUESTIONNAIRE.

Q.S.D. INC
504 MONTEREY DR
APTOS, CA 95004
CONTRACT NUMBER:
ROBERT MURPHY
TITLE:
ADVANCED GENERAL PURPOSE CONTROLLER
TOPIC# 148 OFFICE: NSWC

CURRENT CONTROLLER METHODOLOGY IS BASED ON THE PREMISE THAT REAL-TIME APPLICATIONS WILL EXECUTE WITHIN A WELL UNDERSTOOD ENVIRONMENT WITH CLEARLY DEFINED LIMITS. THESE CONTROLLERS DO NOT ADDRESS PROBLEMS OF APPLICATION DEVELOPMENT AND MAINTENANCE FOR TARGET ENVIRONMENTS WHOSE LIMITS MAY NOT BE KNOWN, WHERE HOST SYSTEMS ARE CUMBERSOME, WHERE PERFORMANCE REQUIREMENTS CHANGE, OR WHERE EMULATORS ARE INADEQUATE. QSD, WHOSE PRINCIPALS DEVELOPED THE FIRST FORTH LANGUAGE DIRECT EXECUTION MICROPROCESSOR, THE NOVIX NC4000, PROPOSE TO PROVIDE A CONTROLLER THAT SOLVES THESE PROBLEMS USING THE FOLLOWING TECHNIQUES: 1. MULTIPLE STACK RISC ARCHITECTURE - YIELDS MINIMUM HARDWARE WITH COMPACT MACHINE CODE. 2. INSITU DEVELOPMENT - TARGET-RESIDENT COM-

SUBMITTED BY

PILER/TOOLS PERMIT CONTROLLER APPLICATIONS TO BE DEVELOPED WITHOUT TRADITIONAL IN-CIRCUIT-EMULATORS. 3. HIGH SPEED INTER-PROCESSOR COMMUNICATIONS - THROUGH STACK SHARING TECHNIQUES, DATA RATES OF 16 MEGABYTES PER SECOND CAN BE ACHIEVED IN THE FORMATION OF NETWORKS. 4. CO-PROCESSOR SUPPORT - HIGH SPEED COMMUNICATION WITH MATH OR DSP CO-PROCESSOR IS SUPPORTED THROUGH A DEDICATED PARALLEL BUS. 5. FORTH AS INTERMEDIATE CODE - REVERSE POLISH NOTATION STREAMLINES INTER-MEDIATE CODE TO SUPPORT THE DEVELOPMENT OF HIGH LEVEL LANGUAGE COM-PILERS/TOOLS, WHILE THE DIRECT EXECUTION OF INTERMEDIATE CODE ACCELERATES PERFORMANCE OF PROGRAMS WRITTEN IN HIGH LEVEL C, ADA, PASCAL, ETC.

QUANTICS INC
993 OLD EAGLE SCHOOL RD
WAYNE, PA 19087
CONTRACT NUMBER:
ROBERT L HIGGINS
TITLE:
IMPROVED ORDNANCE LIFE-CYCLE AFFORDABILITY DEFINITION
EXTENDED TIME-FRAME INVENTORY CAPABILITY IMPLICATIONS
TOPIC# 10 OFFICE: ONT

AN URGENT NEED OF EXPLORATORY DEVELOPMENT PLANNING AND ASSESSMENTS IS EARLY PROJECTION OF ORDNANCE TECHNOLOGY PRODUCTS' LIFE-CYCLE COSTS AND FUTURE INVENTORY CAPABILITY EFFECTS. A MODEL IS NEEDED OF QUANTIFY PROJECTIONS OF FUTURE INVENTORY CAPABILITY DEGRADATION. A POM+15 YEAR PROJECTION METHODOLOGY IS PROPOSED WHICH COUPLES ORDNANCE LIFE-CYCLE COSTS WITH HISTORICAL INVENTORY DEGRADATION CONCEPTS TO ENABLE EVENTUAL LINKING OF RDT&E TECHNOLOGY PRODUCT LIFE-CYCLE COSTS, INVENTORY CAPABILITY DEGRADATION, AND FUNCTIONAL PERFORMANCES TO NAVAL FORCES CAPABILITY. THIS PROPOSAL EXAMINES THE EXPLORATORY DE-VELOPMENT TECHNOLOGY ARENAS ASSOCIATED WITH SURFACE-TO-AIR MISSILES AND TORPEDOES TOGETHER WITH HISTORICAL FYDP/POM DEVELOPMENT/ACQUISI-TIONS BUDGET COSTS FOR PROJECTING POTENTIAL LIFE-CYCLE COSTS OF FUTURE CONFIGURATIONS. CONCURRENT WITH THAT COST EFFORT, REGRESSION ANALYSIS INVENTORY CAPABILITY DEGRADATION PROJECTIONS FOR SURFACE-TO-AIR MISSILES AND/OR TORPEDOES WILL BE GENERATED. ONE OR MORE SAMPLE SURFACE-TO-AIR MISSILE/TORPEDO ORDNANCE FAMILIES WILL THEN BE PROCESSED THROUGH THE MODEL AFFORDABILITIES/DEGRADATION/UTILITY

SUBMITTED BY

SYSTEM ARCHITECTURE TO DEMONSTRATE MODEL FEASIBILITY AND POTENTIAL USEFULNESS AT THE EXPLORATORY DEVELOPMENT RDT&E LEVEL.

QUANTUM COMPOSITES INC
4702 JAMES SAVAGE RD
MIDLAND, MI 48640
CONTRACT NUMBER:
WILLIAM I CHILDS
TITLE:
USE OF STRUCTURAL COMPOSITES FOR AUXILLIARY MACHINERY AND EQUIPMENT
TOPIC# 75 OFFICE: NAVSEA

COMPOSITE MATERIALS ARE BEING USED IN AN INCREASINGLY DIVERSE ARRAY OF APPLICATIONS. IN RECENT YEARS, HIGH STRENGTH COMPOSITES HAVE DEMONSTRATED THE ABILITY TO PERFORM BETTER THAN METALS IN MANY STRUCTURAL USES. THIS PROGRAM IS DESIGNED TO EVALUATE THE USE OF STRUCTURAL COMPOSITES IN SELECTED SHIPBOARD APPLICATIONS. COMPONENTS WILL BE IDENTIFIED AND PERFORMANCE REQUIREMENTS ESTABLISHED. THE APPROPRIATE COMPOSITE MATERIALS WILL BE SELECTED AND COMPONENTS FABRICATED. THE COMPOSITE COMPONENTS WILL BE TESTED TO MEET DESIGN CRITERIA, AND COSTS ESTABLISHED.

QUANTUM DESIGN INC
11568 SORRENTO VALLEY RD - STE 15
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR RONALD E SAGER
TITLE:
NMR REMOTE DETECTION OF NON-METALLIC OBJECTS
TOPIC# 19 OFFICE: ONT

PREVIOUS ATTEMPTS TO EXPLOIT NUCLEAR MAGNETIC RESONANCE (NMR) FOR REMOTE DETECTION APPLICATIONS HAVE SUFFERED FROM INSUFFICIENT PENETRATION DEPTHS AND INADEQUATE SIGNAL-TO-NOISE RATIOS. RECENT ADVANCES IN NMR REMOTE DETECTION TECHNOLOGY WILL ALLOW THE DEVELOPMENT OF AN ADVANCED REMOTE NMR SYSTEM CAPABLE OF LOCATING SMALL, NON-METALLIC OBJECTS. THE UNIQUE GEOMETRY OF THIS REMOTE DETECTION NMR SYSTEM

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WILL MINIMIZE OR ELIMINATE INTERFERENCE DUE TO SOIL VARIATIONS AND THE EFFECTS OF WEATHER CONDITIONS AND WILL PERMIT THE DETECTION OF OBJECTS ON THE SURFACE OF THE EARTH, OBJECTS SHALLOWLY BURIED, AND OBJECTS LOCATED IN SHALLOW WATER. WHILE MOST SPECTRAL INFORMATION IS LOST WHEN NMR IS PERFORMED ON SOLID COMPOUNDS, ADDITIONAL RECENT RESULTS SUGGEST THAT THE NUCLEAR SOLID EFFECT MAY BE USED TO DEFINE UNIQUE NMR SIGNATURES FOR SPECIFIC CHEMICAL COMPOUNDS IN THE SOLID STATE. WE PROPOSE TO DEFINE NMR SIGNATURES FOR THE COMPOUNDS OF INTEREST AND INCORPORATE THE RESULTS INTO THE DESIGN OF AN ADVANCED REMOTE NMR SYSTEM FOR THE DETECTION OF NON-METALLIC OBJECTS. FROM PRESENTLY AVAILABLE DATA, IT APPEARS THAT DEVELOPMENT OF A MAN-PORTABLE SENSOR HEAD IS POSSIBLE AND THAT DEVELOPMENT OF A COMPLETE MAN-PORTABLE SYSTEM MAY BE FEASIBLE.

QUANTUM DESIGN INC
11568 SORRENTO VALLEY RD - STE 15
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR RONALD E SAGER
TITLE:
AN ULTRA-SENSITIVE MAGNETIC MEASUREMENT SYSTEM FOR EVA CORROSION
TOPIC# 117 OFFICE: NSWC

RECENT EXPERIMENTS AT MASSACHUSETTS INSTITUTE OF TECHNOLOGY HAVE SHOWN THAT A NEW NONINVASIVE TECHNIQUE FOR MONITORING THE MAGNETIC FIELDS ASSOCIATED WITH ELECTROCHEMICAL CORROSION CURRENTS CAN GIVE NEW INSIGHTS INTO THE FUNDAMENTAL PHYSICS OF CORROSION PROCESSES. HOWEVER, THE CURRENT RESEARCH IS BEING CONDUCTED ON EQUIPMENT WHICH IS POORLY SUITED TO THESE PARTICULAR MEASUREMENTS. IN CONJUNCTION WITH THE MIT GROUP, WE PROPOSE TO DEVELOP INSTRUMENTATION SPECIFICALLY DESIGNED FOR THESE MEASUREMENTS, WITH THE EVENTUAL GOAL OF PRODUCING A NEW LINE OF INSTRUMENTATION WHICH CAN NONINVASIVELY MEASURE LOW RATES OF CORROSION. WITH AN ANNUAL ECONOMIC COST OF ORDER $70 BILLION DUE TO CORROSION, THE BENEFITS OF IMPROVED UNDERSTANDING OF THE CORROSION PROCESS IS CLEAR.

QUANTUM DESIGN INC
11568 SORRENTO VALLEY RD - STE 15
SAN DIEGO, CA 92121
CONTRACT NUMBER:
DR RONALD E SAGER
TITLE:
SINGLE-SIDED NMR FOR MOISTURE CONTENT EVALUATION OF CO
TOPIC# 212 OFFICE: NAEC/NAVAIR

SUBMITTED BY

THE NUCLEAR MAGNETIC RESONANCE BEHAVIOR OF HYDROGEN NUCLEI IN LIQUID WATER AND WATER TRAPPED IN THE PORES OF MATERIALS IS DRAMATICALLY DIFFERENT THANTHAT OF HYDROGEN NUCLEI IN SOLIDS. SPECIFICALLY, THE RELAXATION RATES OF THE NUCLEI IN THE TWO CASES ARE TYPICALLY DIFFERENT BY TWO TO THREE ORDERS OF MAGNITUDE. DURING PHASE I, WE PROPOSE TO EVALUATE THE USE OF THIS DIFFERENCE FOR DETECTING AND MEASURING THE AMOUNT OF WATER WHICH HAS BEEN ABSORBED INTO COMPOSITE MATERIALS. THE EVALUATION WILL INCLUDE MEASUREMENTS ON SPECIFIC MATERIALS OF INTEREST, AND ESTIMATES OF EXPECTED SIGNAL-TO-NOISE VALUES BASED ON THE RESULTS OF SAMPLE MATERIALS. IN PHASE I WE WILL ALSO EVALUATE THE APPLICABILITY OF SOME NEWLY DEVELOPED NMR TECHNIQUES FOR USE IN THIS APPLICATION.

R A ASSOCS
PO BOX 7
KLAMATH FALLS, OR 97601
CONTRACT NUMBER: N00164-87-C-0207
RICHARD A KING
TITLE:
REPLACEMENT STRATEGY FOR OBSOLETE INTEGRATED CIRCUITS
TOPIC# 185 OFFICE: NWSC/SSPO

RA ASSOCIATES PROPOSES TO INVESTIGATE SOLUTIONS TO THE PROBLEM OF OBSOLETE INTEGRATED CIRCUITS. THIS WILL INCLUDE A SURVEY AND COMPILATION OF THE WORK UNDERWAY BY OTHERS, PLUS AN INDEPTH ANALYSIS OF SEVERAL CANDIDATE SOLUTIONS. SPECIFIC CANDIDATES INCLUDE 54ALS, 54HCT, 54ACT LOGIC FAMILITES. A SOLUTION IS PROPOSED FOR THOSE CASES WHERE THE PINOUT NEEDED IS NOT AVAILABLE. COMPUTER ANALYSIS OF EFFECTS OF REPLACEMENT WILL BE AUGMENTED WITH MANUAL ANALYSIS, TO ARRIVE AT A STRATEGY, OR GROUP OF STRATEGIES, WHICH WILL SOLVE MOST, IF NOT ALL, CASES. REPLACEMENT STRATEGY WILL BE TESTED USING ACTUAL OR SIMULATED BOARDS, UNDER MILITARY TEMPERATURE CONDITIONS. A COMPREHENSIVE FINAL REPORT WILL BE PREPARED. DURING PHASE II, MORE TESTING AND MILITARY QUALIFICATION OF SELECTED PART TYPES WILL BE ACCOMPLISHED.

RADCON
60 MISSION DR
PLEASANTON, CA 94566
CONTRACT NUMBER:
ROBERT L SIMMEN
TITLE:
PASSIVE NON-COOPERATIVE TARGET RECOGNITION
TOPIC# 112 OFFICE: NAVAIR/SC

SUBMITTED BY

THE OVERALL OBJECTIVE OF THE PROJECT IS A DEFINITIVE ALLOCATION OF PNCTR IN THE COMBAT IDENTIFICATION SYSTEM ARCHITECTURE (PHASE I), FOLLOWED BY EXPERIMENTAL INTEGRATION OF ONE OR MORE TECHNOLOGY DEMONSTRATIONS (PHASE II) FOR SUBSEQUENT FLIGHT TEST EVALUATION OF EXPANDED RULES O- ENGAGEMENT. IN PHASE I WE WILL REVIEW THE ROLES AND MISSIONS OF NAVAL AIR TO PERMIT AN ACCURATE APPLICATION OF PNCTR FOR VARIOUS PLATFORMS TO PROVIDE TYPE CLASSIFICATION BEYOND VISUAL RANGE (BVR). WE WILL IDENTIFY AND EXAMINE AVAILABLE TECHNOLOGIES, ASSESS THEIR DEGREE OF APPLICABILITY TO A GIVEN PLATFORM/MISSION, ESTIMATE THE RISKS AND THE TIME PERIOD FOR INITIAL OPERATIONAL CAPABILITY (IOC). TECHNOLOGIES IDENTIFIED AT THIS TIME INCLUDE RF-ESM, E-O IMAGERY, E-O WAVEFORM ANALYSIS, ENHANCED E-O VISUAL IMAGERY, PASSIVE USE OF FIRE CONTROL RADAR, NON-EM/NON-IMAGING SENSORS, OFF-BOARD (DATA LINKED) ASSETS PLUS SPECULATION ON ARTIFICIAL INTELLIGENCE (EXPERT SYSTEM) TECHNOLOGY FOR DATA FUSION AND RESOURCE MANAGEMENT. TRADE STUDIES WILL RESOLVE ONE OR MORE SPECIFIC DETECTION/IDENTIFICATION TECHNOLOGIES AND RECOMMEND A DEMONSTRATION/FLIGHT TEST PROGRAM TO EVALUATE THEIR EFFECTIVENESS TO THE SEVERAL AIR PLATFORMS IN BOTH THE AIR-TO-AIR AND AIR-TO-SURFACE MODE OF FIRE CONTROL SYSTEM OPERATION. RESOURCE MATERIAL WILL INCLUDE CLASSIFIED REPORTS FROM CISCON AND ERASE PROCEEDINGS AND FIELD EXPERIENCE OF THE PRINCIPAL INVESTIGATOR AT EGLIN AFB DURING THE RECENT ARMY SPONSORED NIFFTE '86 EXERCISE AGAINST FLIGHTS OF FIXED AND ROTARY WING AIRCRAFT (RADIATING AND NON-RADIATING).

RAMCOR INC
800 FOLLIN LN
VIENNA, VA 22180
CONTRACT NUMBER: N60530-88-C-0160
MICHAEL D JACOBSON
TITLE:
VARIABLE FLOW GAS GENERATOR
TOPIC# 175 OFFICE: NWC/NAVSEA

A VARIABLE FLOW GAS GENERATOR IS DESIRED TO MEET PRESENT AND FUTURE REQUIREMENTS FOR PRIMARY MISSILE POWER SUPPLIES. VARIABLE FLOW SOLID PROPELLANT GAS GENERATORS CAN OFFER SIGNIFICANT IMPROVEMENTS IN PACKAGING VOLUME WHEN COMPARED WITH CONSTANT FLOW DEVICES. THE PRINCIPLE ADVANTAGE IS THAT THE FLOW RATE CAN BE ADJUSTED TO MATCH

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THE AVERAGE GAS FLOW, RATHER THAN THE PEAK FLOW. THERE ARE THREE TECHNIQUES BY WHICH THE FLOW RATE CAN BE MODIFIED: ACCUMULATOR EFFECT, MASS ADDITION AND FLOW RESTRICTION. THE ACCUMULATOR EFFECT IS THE RESULT OF EXPANSION OF PRESSURIZED GASES IN THE GAS GENERATOR VOLUME. THE MASS ADDITION IS BASED ON INJECTION MASS, EITHER SOLID, LIQUID OR GAS, INTO THE BURNING VOLUME. RESTRICTED FLOW IS BASED ON THE FACT THAT GAS GENERATORS WILL BURN AT A FASTER RATE AT THE ELEVATED PRESSURE INDUCED BY RESTRICTING THE EXHAUST FLOW. AN IMPORTANT PART OF THE TASK IS AN ANALYSIS OF THE FLOW REQUIREMENTS. THIS WOULD INCLUDE EFFECTIVE MODELING OF THE VARIOUS FLOW CONTROL TECHNIQUES AS WELL AS THE STABILITY OF THE FLOW CONTROL MECHANISMS. PRELIMINARY STUDIES INDICATE THAT AN APPROXIMATE 70% REDUCTION IN GAS GENERATOR VOLUME CAN BE ACHIEVED BY USING A DEMAND FLOW SYSTEM.

RAYMOND L & ASSOCS
PO BOX 7925
NEWPORT BEACH, CA 92658
CONTRACT NUMBER: N00164-87-C-0238
DR LOUIS RAYMOND
TITLE:
THE PHYSICS OF METAL MATRIX COMPOSITES
TOPIC# 180 OFFICE: NWSC/SSPO

ALUMINUM/SILICON CARBIDE PARTICULATE COMPOSITES PROMISE TO PROVIDE COST-EFFECTIVE PERFORMANCE IMPROVEMENTS FOR HIGH-PERFORMANCE MISSILES. HOWEVER, IN ORDER TO AVOID RISK IN THESE DEMANDING APPLICATIONS, MORE INFORMATION IS NEEDED ON THE HIGH-TEMPERATURE MECHANICAL PROPERTIES OF THESE MATERIALS. IN THIS PHASE I EFFORT, EXPERIMENTS WILL DETERMINE THE DEPENDENCE OF COMPOSITE STRENGTH ON TEMPERATURE AND STRAIN RATE. FAILURE MECHANISMS WILL BE INVESTIGATED BY FRACTOGRAPHY, AND KINETIC PARAMETERS (SUCH AS ACTIVATION ENERGY, STRAIN-RATE EXPONENT, AND ACTIVATION AREA) FOR PLASTIC DEFORMATION OF Al/SiC(p) WILL BE DETERMINED. THE PROJECT WILL PROVIDE QUANTITATIVE INFORMATION ON THE KINETICS OF FAILURE PROCESSES, WHICH WILL ALLOW USERS OF THIS MATERIAL TO PREDICT MATERIAL PERFORMANCE IN MISSILE SYSTEMS AND SIMILAR APPLICATIONS.

REFRACTORY COMPOSITES INC
12220-A RIVERA RD
WHITTIER, CA 90606
CONTRACT NUMBER:
EDWARD L PAQUETTE
TITLE:
TAILORABLE HIGH THERMAL CONDUCTIVITY CTE MATCHED COMPO
CIRCUIT BOARDS
TOPIC# 11 OFFICE: ONT

SUBMITTED BY

THIS PHASE I PROGRAM WILL DEMONSTRATE THE TECHNICAL VIABILITY OF DESIGNING AND MANUFACTURING INTEGRATED CERAMIC MATRIX COMPOSITE CIRCUIT BOARDS FOR A VARIETY OF ELECTRONIC DEVICES INCLUDING (HIGH POWER [25-50W] HIGH DENSITY [300 - 500 LEADS]). GRAPHITE FIBER REINFORCED CVI CERAMIC MATRIX COMPOSITE PLATES WILL BE FABRICATED WITH THREE FIBER VOLUME FRACTIONS (35, 40, 45%) USING REFRACTORY COMPOSITES', INC. NEW RECOMP COMPOSITE TECHNOLOGY. RECOMP MATERIALS ARE MECHANISTIC IN NATURE AS THE FIBER AND MATRIX SELECTION CAN BE TUNED TO MEET A VARIETY OF OPERATIONAL NEEDS. THIS PROGRAM PROPOSES THE DISTINCT POSSIBILITY THAT HIGH K, SILICON MATCHED CTE COMPOSITE SUBSTRATES CAN BE PRODUCED WITH THIS TECHNOLOGY. A SERIES OF PANELS WILL BE FABRICATED USING NEW HIGH K (2X COPPER) PITCH FIBERS IN A SILICON CARBIDE MATRIX. DEMONSTRATION OF RF BARRIERS AND DIELECTRIC INSULATION LAYERS, HIGH DENSITY COPPER TRACES AND INTERCONNECT VIAS WILL BE CREATED USING CVD/PVD ADAPTATION OF RCI BACKGROUND TECHNOLOGY. EXISTING SEMICONDUCTOR MASKING AND ETCHING TECHNIQUES WILL BE ADOPTED FOR PROTOTYPE DEMONSTRATION PURPOSES. TECHNICAL ADVICE AND CONSULTATION RELATIVE TO DEVICE DESIGN, INTERCONNECT, ETCHING AND SYSTEM UTILITY DEMONSTRATION WILL BE PROVIDED BY MOTOROLA, INC., ADVANCED PACKAGING GROUP. A SIGNIFICANT TASK IN THIS PROGRAM WILL BE THE INITIATION OF PLANAR INTEGRATION DESIGN AND LAYER APPLICATION.

REFRACTORY COMPOSITES INC
12220-A RIVERA RD
WHITTIER, CA 90606
CONTRACT NUMBER:
EDWARD L PAQUETTE
TITLE:
HAFNIUM DiBORIDE MATRIX CERAMIC COMPOSITES FOR HYPERSO
EDGE STRUCTURES
TOPIC# 137 OFFICE: NSWC

REFRACTORY COMPOSITES, INC. PROPOSES TO CHEMICALLY VAPOR INFILTRATE HfB2 INTO A GRAPHITE FIBER STRUCTURE. INITIAL PROCESS EVALUATION TRIALS WILL BE FOLLOWED BY FLAT LAMINATE AND FOR .030 INCH RADIUS EDGES, FOLDED LAMINATE CONSTRUCTION UTILIZING FMI'S 3 MICRON GRAPHITE FIBER IN THE FORM OF 2D CLOTH. SEM AND IMMA ANALYSES WILL BE CONDUCTED THROUGHOUT THE PROCESS DEVELOPMENT AND TEST MATERIAL MANUFACTURING ACTIVITIES TO UNDERSTAND AND CONTROL STOICHIOMETRY OF THE

SUBMITTED BY

MATRIX AND PROVIDE UNDERSTANDING OF INFILTRATION UNIFORMITY, FIBER/ MATRIX INTERFACE CHARACTERISTICS AND DEPOSIT MORPHOLOGY.

REIFER CONSULTANTS INC
25550 HAWTHORNE BLVD - STE 208
TORRANCE, CA 90505
CONTRACT NUMBER:
DONALD J REIFER
TITLE:
SOFTWARE PHYSICS MEASURES OF PROGRESS
TOPIC# 42 OFFICE: SPAWAR

THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO DEVELOP A SOFTWARE PHYSICS-BASED MANAGEMENT INDICATOR FOR USE IN ASSESSING THE STATUS OF AND GAINING INSIGHT INTO THE PROGRESS OF SOFTWARE DEVELOPMENTS BEING DONE BY CONTRACTORS FOR THE U.S. NAVY. THE INDICATORS WILL BE BASED UPON EMPIRICAL DATA CAPTURED FROM ON-GOING AND COMPLETED WEAPON SYSTEM PROJECTS. THE INDICATORS WILL BE DESIGNED TO COMPLEMENT SIMILAR INDICATORS WHICH RELY ON EARNED VALUE AND SOFTWARE QUALITY METRICS. THE INDICATORS WILL ALSO BE COMPATIBLE WITH THE COMMONLY USED SOFTWARE COST ESTIMATING MODELS SO THAT COST- AND SCHEDULE-TO-COMPLETE EXERCISES CAN BE ACCOMPLISHED USING CURRENTLY AVAILABLE PACKAGES. THIS PHASE I PROPOSAL WILL ESTABLISH THE MATHEMATICAL FOUNDATION FOR THE INDICATORS. IT WILL ALSO PROVIDE A PLAN WHEREBY A RAPID PROTOTYPE OF A TOOL TO MECHANIZE THE INDICATOR WILL BE DEVELOPED AS PART OF A FOLLOW-ON PHASE II SBIR EFFORT.

REMTECH INC
2603 ARTIE ST - STE 21
HUNTSVILLE, AL 35805
CONTRACT NUMBER:
RICHARD L PALKO
TITLE:
HIGH SPEED PARTICLE TRAJECTORY MEASUREMENT USING STERE
TOPIC# 200 OFFICE: NUSC

LAMINAR FLOW OFFERS SIGNIFICANT PAYOFF TO UNDERSEA VEHICLES BY PROVIDING DRAG REDUCTION AND REDUCED RADIATED NOISE. IT HAS BEEN

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SHOWN THAT SMALL PARTICLES CAN CAUSE LAMINAR FLOW TO BECOME TURBULENT. A TECHNIQUE IS NEEDED TO MEASURE THE TRAJECTORY A PARTICLE TAKES AS IT MOVES PAST AN UNDERWATER VEHICLE. THE DEVELOPMENT OF LASER SYSTEMS HAS PROVIDED A MEANS OF OBTAINING FLOWFIELD DATA, HOWEVER, THESE SYSTEMS ARE VERY SENSITIVE TO ADJUSTMENT AND ALIGNMENT, AND REQUIRE HIGHLY TRAINED PERSONNEL FOR OPERATION AND DATA ANALYSIS. A LESS SENSITIVE TECHNIQUE FOR OBTAINING QUANTITATIVE FLOWFIELD DATA IS NEEDED. THE WORK PROPOSED HERE WILL USE STERO PHOTOGRAPHY AND SPECIALLY DEVELOPED LIGHTING TECHNIQUES TO MEASURE A PARTICLE TRAJECTORY AND VELOCITY AS IT PASSES NEAR AN UNDERSEA VEHICLE. PHASE I COVERS THE DESIGN OF THE SYSTEM FOR STEREO PHOTOGRAPHIC ANALYSIS FOR THE TRACKING OF A PARTICLE PASSING NEAR AN UNDERSEA VEHICLE. THIS WILL INCLUDE DETERMINATION OF CAMERA REQUIREMENTS, DESIGN OF ILLUMINATION AND CONTROL POINT SYSTEMS, SPECIFICATION AND/OR DESIGN OF SUPPORT EQUIPMENT, AND A DETAILED PLAN FOR A PROOF-OF-CONCEPT TEST. PHASE II WILL BE USED TO ACQUIRE, FABRICATE, AND ASSEMBLE THE SYSTEMS PROPOSED IN PHASE I AND TO PERFORM THE PROOF-OF-CONCEPT TEST AND EVALUATION.

RESEARCH OPPORTUNITIES INC
2200 AMAPOLA CT - STE 101
TORRANCE, CA 90501
CONTRACT NUMBER:
WILLIAM C RILEY
TITLE:
COMPOSITE MATERIALS FOR ELECTRONIC DEVICES
TOPIC# 11 OFFICE: ONT

THE PRIMARY OBJECTIVE IS TO DEFINE THE POTENTIAL FOR USE OF COMPOSITE MATERIALS IN NAVY ELECTRONIC DEVICES. METAL, CARBON, CERAMIC AND ORGANIC MATRIX COMPOSITES WILL BE PROCURED AND WILL BE EVALUATED BASED ON THERMAL EXPANSION, THERMAL CONDUCTIVITY, STIFFNESS, HEAT CAPACITY, DENSITY, AND COST. PARTICULAR EMPHASIS IS ON THE USE OF GRAPHITE FIBERS WITH EXTREMELY HIGH THERMAL CONDUCTIVITY (UP TO 3 TIMES THAT OF COPPER), AN EXCEEDINGLY HIGH SPECIFIC STIFFNESS AND A NEGATIVE COEFFICIENT OF THERMAL EXPANSION WHICH LEADS TO TAILORING OF THE COMPOSITE TO MATCH THERMAL EXPANSION OF CERAMICS OR OTHER LOW THERMAL EXPANSION MATERIALS. APPLICATIONS TO BE STUDIES WILL INCLUDE DIMENSIONALLY STABLE THERMAL COLUMNS, REINFORCED DIELECTRIC AND REIN-

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FORGED METALS WITH A THERMAL EXPANSION MATCH FOR CERAMIC CHIP CARRIERS. COST ESTIMATES WILL BE MADE RELATIVE TO VARIOUS COMPOSITE PRODUCTION LEVELS. THE BASIS WILL BE ESTABLISHED FOR DEFINING OPTIMUM COMPOSITE DESIGNS FOR SPECIFIC DEVICE REQUIREMENTS CONSISTENT WITH PERFORMANCE/COST TRADEOFFS.

RESEARCH OPPORTUNITIES INC
2200 AMAPOLA CT - STE 101
TORRANCE, CA 90501
CONTRACT NUMBER:
WILLIAM C RILEY
TITLE:
GRAPHITE REINFORCED MAGNESIUM FOR MATCHING THE THERMAL
OF ALUMINA
TOPIC# 124 OFFICE: NSWC

GRAPHITE FIBER REINFORCED MAGNESIUM COMPOSITES WILL BE DESIGNED TO MATCH THE THERMAL EXPANSION OF ALUMINA FOR USE AS SUPPORT STRUCTURE FOR ALUMINA CHIP CARRIERS. COMPOSITES WILL BE FABRICATED BY AT LEAST TWO DIFFERENT METHODS. FIBER VOLUME AND FIBER MODULUS WILL BE TREATED AS CONTROLLED VARIABLES. TESTING WILL EMPHASIZE THERMAL EXPANSION AND MECHANICAL PROPERTIES. THE PERCENT OF RULE-OF-MIXTURES PROPERTIES ATTAINED WILL BE DETERMINED THROUGH CAREFUL TRACEABILITY. PROPERTY COMPARISONS WILL BE MADE BETWEEN GRAPHITE-MAGNESIUM AND OTHER METAL MATRIX COMPOSITES. COST ESTIMATES WILL BE MADE RELATIVE TO VARIOUS PRODUCTION LEVELS. THE BASIS WILL BE ESTABLISHED FOR DEFINING AN OPTIMUM COMPOSITE CONSISTENT WITH PERFORMANCE/COST TRADEOFFS.

RO-SEARCH INC
PO BOX 188
WAYNESVILLE, NC 28786
CONTRACT NUMBER:
HORACE AUBERRY
TITLE:
NON-METALLIC (SELF-CURING) TOE PROTECTION FOR FOOTWEAR
TOPIC# 96 OFFICE: NAVSUP

SUBMITTED BY

A MATERIAL SUBSTITUTE FOR THE CONVENTIONAL FOOTWEAR TOE REINFORCE AND A METHOD OF INCORPORATING IT INTO FOOTWEAR WHICH CLOSELY FOLLOWS THE CONVENTIONAL METHODS FOR NON-SAFETY FOOTWEAR. AS A PART OR CONSEQUENCE OF THE PROCESSING, THE MATERIAL BECOMES SUFFICIENTLY RIGID AND STRONG TO WITHSTAND THE COMPRESSION AND IMPACT RESISTANCE OF AN2I Z4L FOR SAFETY FOOTWEAR.

ROCKET ENGINEERING CORP
RTE 6 - BOX 88
SEYMOUR, IN 47274
CONTRACT NUMBER: N60530-88-C-0159
IRVING S WAIT
TITLE:
VARIABLE FLOW GAS GENERATOR
TOPIC# 175 OFFICE: NWC/NAVSEA

ROCKET ENGINEERING'S OBJECTIVE IS TO FORMULATE AND PRODUCE A CLEAR-BURNING, LOW FLAME TEMPERATURE PROPELLANT. THIS PROPELLANT WILL THEN BE USED IN AN ENGINE THAT WILL HAVE THE CAPABILITY OF BEING CYCLED A NUMBER OF TIMES FROM NORMAL OPERATING PRESSURES TO IDLE PRESSURES. THE PROPELLANT PORTION OF THE EFFORT WILL INCLUDE PURIFICATION OF THE AMMONIUM NITRATE OXIDIZER AND THE USE OF PRIMARILY ORGANIC CATALYSTS TO ELIMINATE METALLIC RESIDUES FROM THE EXHAUST PRODUCTS. THE THROTTLE PORTION OF THE EFFORT WILL KEY ON TWO DESIGNS: 1) A DESIGN EMPLOYING A SINGLE ORIFICE THAT MAY BE VARIED IN EFFECTIVE THROAT DIAMETER AND, 2) A SECONDARY ORIFICE THAT MAY BE OPENED AND CLOSED UPON COMMAND TO CONTROL CHAMBER PRESSURE.

SAT-CON TECHNOLOGY CORP
71 ROGERS ST
CAMBRIDGE, MA 02142
CONTRACT NUMBER:
DR BRUCE G JOHNSON
TITLE:
DEVELOPMENT OF FLYWHEEL ENERGY STORAGE FOR REPLACEMENT TORPEDO MK 48 ADCAP THERMAL BATTERY
TOPIC# 86 OFFICE: NAVSEA

SUBMITTED BY

A REPLACEMENT BATTERY FOR THE THERMAL BATTERY CURRENTLY BEING USED IN THE MK 48 TORPEDO IS SOUGHT. THIS REPLACEMENT BATTERY SHOULD PERFORM AS A FORM, FIT, AND FUNCTION REPLACEMENT FOR THE EXISTING BATTERY BUT ALLOW MULTIPLE FIRING ATTEMPTS. FLYWHEEL ENERGY STORAGE IS A PROMISING MEANS OF IMPLEMENTING LOW MAINTENANCE, SHORT TERM ENERGY STORAGE FOR THIS TYPE OF APPLICATION. THESE FLYWHEEL SYSTEMS OFFER A NUMBER OF ADVANTAGES COMPARED TO NICKEL-CADIUM OR OTHER ELECTROCHEMICAL BATTERIES. THESE ADVANTAGES INCLUDE LONG SHELF-LIFE, LOW MAINTENANCE, LOW SELF-DISCHARGE, UNLIMITED CHARGE/DISCHARGE CYCLING, AND THE ABILITY TO DETERMINE STATE-OF-CHARGE. A RECENT NAVY PROGRAM SUPPORTED THE DEVELOPMENT OF SUCH A SMALL FLYWHEEL ENERGY STORAGE SYSTEM SUITABLE FOR AERONAUTICAL APPLICATIONS. THIS SYSTEM, CALLED AN INERTIAL POWER STORAGE UNIT (IPSU), PERFORMS AS A FORM, FIT, AND FUNCTION REPLACEMENT FOR A NiCd BATTERY. USING THE TECHNOLOGY BASE DEVELOPED DURING THE IPSU PROGRAM, THE OPPORTUNITY EXISTS TO DEVELOP FLYWHEEL ENERGY STORAGE SYSTEMS THAT WILL ADVANTAGEOUSLY REPLACE THE THERMAL BATTERY IN THE MK 48 TORPEDO. THIS PROPOSED RESEARCH PROGRAM WILL INVESTIGATE THE TECHNICAL FEASIBILITY OF USING FLYWHEEL ENERGY STORAGE FOR THIS APPLICATION.

SCHMITT TECHNOLOGY ASSOCS
25 SCIENCE PK
NEW HAVEN, CT 96511
CONTRACT NUMBER:
DR B L HALPERN
TITLE:
GAS JET DEPOSITION OF MULTICOMPONENT ULTRAFINE MICROST
TOPIC# 8 OFFICE: ONR

THE POTENTIAL TECHNOLOGICAL IMPORTANCE OF MULTICOMPONENT ULTRAFINE MICROSTRUCTURES MAKES IT ESSENTIAL TO DEVELOP METHODS OF FORMATION WHICH PERMIT BOTH HIGHER GROWTH RATES AND IMPROVED CONTROL OVER MATERIAL PROPERTIES. WE PROPOSE A NEW TECHNIQUE, "GAS JET DEPOSITION", THAT HAS THE POTENTIAL TO PROVIDE THESE CAPABILITIES AND OTHER ADVANTAGES OVER ESTABLISHED METHODS. IN THIS TECHNIQUE, DEPOSITING ATOMS, MOLECULES OR CLUSTERS ARE "SEEDED" INTO A FREE JET WHICH IS DIRECTED AT A SUBSTRATE IN A "HIGH" BACKGROUND PRESSURE. THE DEPOSITION RATES CAN BE EXCEPTIONALLY LARGE. DESPITE THE HIGH PRESSURE, THE IMPACT ENERGY OF THE DEPOSITING SPECIES CAN BE VARIED OVER MANY

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ELECTRON VOLTS TO INFLUENCE DEPOSIT PROPERTIES. VIRTUALLY ANY METAL, SEMICONDUCTOR, OR INSULATOR CAN BE EFFICIENTLY DEPOSITED. THE COMBINATION OF THESE FEATURES IN ONE METHOD MAKES GAS JET DEPOSITION A POTENTIALLY POWERFUL AND COMMERCIALLY ATTRACTIVE APPROACH TO PRODUCTION OF BOTH MULTILAYER AND CLUSTER/MATRIX STRUCTURES. IN PHASE I WE WILL DEMONSTRATE AND EVALUATE ITS ABILITY TO DEPOSIT BOTH TYPES OF ULTRAFINE STRUCTURES AT HIGH RATE. IN PHASE II WE WILL SYSTEMATICALLY DEVELOP THESE CAPABILITIES INTO A VIABLE, INTEGRATED TECHNOLOGY.

SCI-SO INC
PO BOX 25446
ALBUQUERQUE, NM 87125
CONTRACT NUMBER:
DR ROBERT M WESSELY
TITLE:
SOFTWARE TIMING/RELIABILITY WORKSTATION (STRW) DEVELOP
TOPIC# 142 OFFICE: NSWC

TIMING/RELIABILITY ASPECTS OF SYSTEM MUST BE ADDRESSED AT ALL LEVELS IN THE DEVELOPMENT OF TACTICAL REAL-TIME SOFTWARE SYSTEMS. IT IS PARTICULARLY IMPORTANT THAT TACTICAL SITUATION OVERLOADING, UNDERLOADING, AND GRACEFUL DEGREDATION BE ANALYZED AND EVALUATED EARLY IN A SYSTEM DEVELOPMENT CYCLE. SCI-SO HAS PROPOSED A PHASE I PROGRAM TO INITIATE THE DEVELOPMENT OF A SOFTWARE TIMING/RELIABILITY WORKSTATION (STRW) AS A SYSTEM TIMING PARAMETER/ATTRIBUTE ANALYSIS, DEFINITION, AND VALIDATION TOOL TO MEET THIS URGENT NEED. DURING PHASE I, SCI-SO PROPOSES TO ESTABLISH AN OPERATIONAL SCENARIO FOR THE STRW, THEN IDENTIFY, ANALYZE, AND SELECT A COMPATABLE FAMILY OF STRW FEATURES, AND, FINALLY, TO DOCUMENT THE EVOLVING STRW IN A SYSTEM LEVEL SPECIFICATION. SCI-SO BELIEVES THAT THE PROPOSED PHASE I PROGRAM WILL CONFIRM THE FEASIBILITY AND DESIRABILITY OF THE STRW AND WILL PROVIDE AN EXCELLENT FOUNDATION ON WHICH A PHASE II EFFORT CAN BE INITIATED TO CONTINUE STRW DEVELOPMENT.

SCIENTIFIC ENGINEEPING INSTRUMENT INC
1275 KLEPPE LN - STE 14
SPARKS, NV 89431
CONTRACT NUMBER:
LARRY G YORI
TITLE:
MICROWAVE MODULAR INSTRUMENT PACKAGE
TOPIC# 152 OFFICE: NSWC

SUBMITTED BY

AUTOMATIC TEST EQUIPMENT (ATE) FOR RADIO FREQUENCY AND MICROWAVE APPLICATIONS TYPICALLY EMPLOY CONVENTIONAL "RACK-AND-STACK" IEEE-488 INSTRUMENTS TO PROVIDE STIMULUS AND MEASUREMENT FUNCTIONS. EACH INSTRUMENT IS A STAND-ALONE TEST FUNCTION AND USUALLY CONTAINS IT'S OWN DEDICATED MICROPROCESSOR, POWER SUPPLY, CHASSIS, FRONT PANEL, AND EXTERNAL COMMUNICATIONS INTERFACE. IN ATE SYSTEM APPLICATIONS, CONSIDERABLE HARDWARE REDUNDANCY RESULTS, SINCE THESE CIRCUIT ELEMENTS ARE DUPLICATED IN EACH INSTRUMENT. SOFTWARE REDUNDANCY ALSO EXISTS, AS SEPARATE SOFTWARE MODULES ARE NEEDED FOR THE SYSTEM COMPUTER TO COMMUNICATE WITH EACH INSTRUMENT. RECENT PROGRESS HAS BEEN MADE IN THE DESIGN OF MODULAR INSTRUMENT SYSTEMS WHICH PROVIDE A COMMON CHASSIS, MICROPROCESSOR, POWER SUPPLY, AND COMMUNICATIONS INTERFACE TO HOST A NUMBER OF MODULAR INSTRUMENT PLUG-INS. THIS CONCEPT REDUCES HARDWARE/SOFTWARE REDUNDANCY, BUT TO-DATE, HAS BEEN APPLIED ONLY TO LOW-FREQUENCY ANALOG (UNDER 100 MHz) INSTRUMENTS. IT IS PROPOSED TO INVESTIGATE THE FEASIBILITY OF EXTENDING THE MODULAR INSTRUMENT CONCEPT TO HIGHER FREQUENCY INSTRUMENTS, PARTICULARLY INTO THE MICROWAVE REGION (UP TO 40 GHz).

SCIENTIFIC SYSTEMS INC
ONE ALEWIFE PL
CAMBRIDGE, MA 02140
CONTRACT NUMBER:
DONALD GUSTAFSON
TITLE:
COMPUTER AIDED DESIGN (CAD) DIGITAL FILTERING/SMOOTHIN
TOPIC# 255 OFFICE: NAVAIR/NATC

RECENTLY CANONICAL VARIATE ANALYSIS (CVA) THEORY HAS BEEN SUCCESSFULLY APPLIED TO ADAPTIVE IDENTIFICATION OF MULTI-INPUT MULTI-OUTPUT (MIMO) SYSTEMS IN OPEN - AND CLOSED-LOOP CONFIGURATION. THE METHOD AUTOMATICALLY SELECTS AN OPTIMAL MODEL ORDER BASED ON AN INFORMATION THEORETIC CRITERION KNOWN AS AKAIKE INFORMATION CRITERION (AIC). UNDER THE SCOPE OF THIS PROPOSAL, A NEW FILTERING AND SMOOTHING SCHEME BASED ON CVA-AIC WILL BE DEVELOPED THAT WILL BE USED TO PROCESS DATA WITH ABRUPT CHANGES. THE PHASE I EFFORT OF A THREE PHASE RESEARCH PROGRAM CONSISTS OF THREE MAJOR TASKS: (i) TO DEVELOP A CVA-AIC BASE FILTERING/SMOOTHING SCHEME FOR HANDLING DATA WITHOUT ANY ABRUPT CHANGE, (ii) TO DEVELOP A CVA-AIC BASED TECHNIQUE FOR

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DETECTING AND ESTIMATING THE TIME OF OCCURRENCE OF ABRUPT CHANGE AND (iii) INTEGRATING THESE SCHEMES INTO A COMPLETE DESIGN PACKAGE. CVA-AIC TECHNIQUE WILL ALSO BE USED FOR OPTIMAL ORDER SELECTION OF THE POLYNOMIAL IN THE "CLASSICAL" LEAST SQUARE MOVING ARC POLY-NOMIAL SMOOTHING TECHNIQUES. PHASE I WILL LAY THE FOUNDATION FOR PHASE II DURING WHICH A CVA-AIC BASED CAD SOFTWARE PACKAGE FOR DESIGNING FILTERING/SMOOTHING SCHEMES WILL BE DEVELOPED.

SEACO INC
2845 NIMITZ BLVD
SAN DIEGO, CA 92106
CONTRACT NUMBER:
G O MAKI
TITLE:
DEVELOPMENT OF DIVER MONITORING EQUIPMENT
TOPIC# 13 OFFICE: ONT

THIS PROPOSAL IS FOR THE DEVELOPMENT OF AN IN-WATER ACOUSTIC TELEMETRY SYSTEM THAT CAN MONITOR A DIVER'S PHYSIOLOGICAL VARIABLES WHILE HE IS FUNCTIONING IN A MISSION ROLE. THE SYSTEM WAS DEVELOPED FOR HIGH DATA RATE AUDIO AND VIDEO TRANSMISSION BETWEEN THE SEAFLOOR AND THE SURFACE, AND OFFERS AN IDEAL BASIS AS A SPECIAL-PURPOSE TOOL FOR IN-SITU MONITORING OF HEART RATE, TEMPERATURE, ETC. THE BASIC SYSTEM HAS BEEN PROTOTYPE AND TESTED IN 5,000 FSW; THE PROPOSED EFFORT WILL BE TO MINIATURIZE THE DIVER SENSOR SYSTEM AND DEVELOP A MEMORY BANK TO STORE THE SENSED DATA UNTIL COMMANDED BY THE SURFACE MONITOR.

SEES INC
11020 SOLWAY SCHOOL RD - STE 101
KNOXVILLE, TN 37931
CONTRACT NUMBER:
R L ANDREWS
TITLE:
TELEOPERATOR FEEDBACK SYSTEMS
TOPIC# 239 OFFICE: NOSC/NAVSEA

THE TELEOPERATED SENSITIVE END EFFECTOR SYSTEM (TELESEES) UTILIZES

SUBMITTED BY

THE MECHANICAL RESPONSE OF THE SENSITIVE END EFFECTOR SYSTEM (SEES) TO PROVIDE THE OPERATOR IN A TELEOPERATED SYSTEM WITH TACTILE FEEDBACK. THE SEES IS A TACTILE SENSOR THAT PRODUCES A SIGNAL PROPORTIONAL TO THE PRESSURE OR FORCE. CONVERSELY, PRESSURE CAN BE APPLIED INTERNALLY TO PRODUCE A DEFLECTION. THE DEFLECTED FORCES IS IN DIRECT CONTACT WITH THE OPERATORS HANDS OR FINGERS.

SENSIS CORP
THE MARKET PL - RTE 92
MANLIUS, NY 13104
CONTRACT NUMBER:
ERNEST B ROCJWOOD
TITLE:
RADAR CROSS SECTION TARGETS--DYNAMIC BEHAVIOR
TOPIC# 71 OFFICE: NAVSEA

THE SURVEILLANCE REQUIREMENTS TO DEFEND THE CARRIER GROUP AGAINST THE LOW CROSS SECTION, HIGH SPEED CRUISE MISSILE THREAT IS IMPOSING. THE ENERGY AND MOMENTUM INTERACTION OF THESE HIGH SPEED BODIES WITH THE ATMOSPHERE AND THE SEA SURFACE, EITHER AT BREAKWATER, OR DURING LEVEL FLIGHT, MAY VERY LIKELY CREATE DISTURBANCES WHICH ARE OBSERVABLE BY LONG RANGE RF SENSORS. THE OBJECTIVES OF THE PHASE I PROGRAM EFFORT ARE TO PROVIDE A BASIS FOR MEANINGFUL EXPLORATION OF THE TARGET DETECTION AND RECOGNISTION CAPABILITY AFFORDED BY THE DYNAMIC INTERACTION PHENOMENA AFFECTING RADAR CROSS SECTION SIGNATURES. THIS IS TO BE ACCOMPLISHED THROUGH WELL PLANNED EXPERIMENTS AND MODELLING TO BE CONDUCTED DURING PHASE II.

SENTIENT SYSTEMS TECHNOLOGY INC
5001 BAUM BLVD
PITTSBURGH, PA 15213
CONTRACT NUMBER:
GARY KILIANY
TITLE:
LOW-COST HELMET MOUNTED EYE GAZE SENSOR
TOPIC# 262 OFFICE: NAVAIR/NATC

THE PRIMARY OBJECTIVE OF THIS PHASE I PROPOSAL IS TO DEMONSTRATE THAT

SUBMITTED BY

APPLICATION OF SENTIENT SYSTEMS TECHNOLOGY'S (SST'S) LOW COST, EYE GAZE SENSING TECHNOLOGY CAN ULTIMATELY RESULT IN A PRACTICAL, LOW-COST ROBUST, HELMET MOUNTED EYE GAZE SENSOR. SPECIFICALLY, THE TECHNOLOGY DEVELOPED FOR SST'S EYE TYPER MODEL 100 AND EYE TYPER MODEL 200 PRODUCTS WILL BE COMBINED WITH A NEW, LOW COST, LOW WEIGHT, HIGH SENSITIVITY, IMAGE SENSOR. THIS SENSOR SYSTEM, WHEN MOUNTED ON A HELMET AND COMBINED WITH SST'S PROPRIETARY, LOW COST, IMAGE DIGITIZATION AND PROCESSING HARDWARE, WILL BE EXTENSIVELY EVALUATED WITH REGARD TO EYE GAZE MONITORING PERFORMANCE AND ULTIMATE PRODUCTION FEASIBILITY.

SEPARATION SYSTEMS TECHNOLOGY
6242 MT AGUILAR DR
SAN DIEGO, CA 92111
CONTRACT NUMBER:
ROBERT L RILEY
TITLE:
MEMBRANE SYSTEM FOR SHIPBOARD DEHYDRATION APPLICATIONS
TOPIC# 240 OFFICE: DTNSRDC

THIS PHASE I PROGRAM IS DIRECTED TOWARD THE DEVELOPMENT OF A DIMETHYL SILICONE MEMBRANE SYSTEM CAPABLE OF REMOVING WATER VAPOR FROM COMPRESSED AIR AT 125 PSIG, 122 F, TO YIELD DRY AIR WITH A - 40 F EQUIVALENT DEW POINT. A LABORATORY-SCALE PROTOTYPE WILL BE FABRICATED AND EVALUATED TO DETERMINE THE FEASIBILITY OF THE CONCEPT TO DEVELOP A SHIPBOARD DEHYDRATION SYSTEM THAT IS COMPACT, HAS NO MOVING PARTS OR POWER REQUIREMENTS, OTHER THAN A SUPPLY OF AIR FROM A SHIPBOARD COMPRESSOR. THE SYSTEM WILL BE MAINTENANCE FREE AND NO ADVERSE EFFECTS WILL OCCUR FROM LOSS OF POWER TO THE COMPRESSOR SYSTEM. COMPLETE EFFICIENCY OF THIS DEHYDRATOR WILL RESUME WITHIN A FEW SECONDS FOLLOWING RESTORATION OF POWER.

SEPARATION SYSTEMS TECHNOLOGY
6242 MT AGUILAR DR
SAN DIEGO, CA 92111
CONTRACT NUMBER:
CLYDE E MILSTEAD
TITLE:
DEVELOPMENT OF A MEMBRANE SYSTEM FOR THE SHIPBOARD PRE
OF SEAWATER
TOPIC# 242 OFFICE: DTNSRDC

SUBMITTED BY

THIS PHASE I PROGRAM IS DIRECTED TOWARD THE DEVELOPMENT OF A CHARGE-ENHANCED MICROFILTRATION MEMBRANE SYSTEM FOR REMOVAL OF SUSPENDED SOLIDS AND BIOLOGICAL MATERIALS FROM SEAWATER. THE PERFORMANCE OF THIS MEMBRANE WILL BE EVALUATED ON LIVE SEAWATER AT LOW PRESSURES TO DETERMINE ITS CAPABILITY FOR INCORPORATION INTO A NEW SPIRAL-WOUND ELEMENT DESIGN FOR USE IN THE SHIPBOARD PRETREATMENT OF SEAWATER TO PROVIDE AN IMPROVED FEEDWATER QUALITY FOR REVERSE OSMOSIS (RO) SYSTEMS. VARIOUS MODIFICATIONS OF THE MEMBRANE BY CHANGES IN THE FABRICATION TECHNIQUES WILL BE MADE AS REQUIRED UNTIL THE OBJECTIVES HAVE BEEN MET.

SIG-PRO SYSTEMS INC
1121 BALDWIN ST
SALINAS, CA 93906
CONTRACT NUMBER:
LONNIE A WILSON
TITLE:
UNWANTED RADAR WAVEFORM MODULATIONS
TOPIC# 163 OFFICE: JCMPO

UNWANTED RADAR WAVEFORM MODULATIONS EXIST ON ALL REAL-WORLD RADAR SYSTEMS. THESE UNWANTED MODULATIONS CHANGE BECAUSE OF DIFFERENCES IN OPERATING CONDITIONS AND COMPONENT AND SUBSYSTEM AGING. SPECIFIC TECHNIQUES ARE PROPOSED FOR ELIMINATING OR CHANGING THE UNWANTED MODULATIONS. THESE TECHNIQUES CAN MAKE THE WAVEFORM PARAMETERS IDENTICAL FROM RADAR SET TO RADAR SET. ALSO, THE TECHNIQUES SHOULD PROVIDE ENHANCED RADAR ECCM CAPABILITIES BY CHANGING THE UNWANTED MODULATIONS.

SIGMA RESEARCH INC
8710 - 148TH AVE NE
REDMOND, WA 98052
CONTRACT NUMBER:
THOMAS J DAVIS
TITLE:
HIGH SENSITIVITY ALL METALS LOCATOR
TOPIC# 20 OFFICE: ONT

SUBMITTED BY

THIS PROJECT IS DIRECTED AT ADVANCED METHODS FOR DETECTING AND LOCATING SMALL METALLIC COMPONENTS OF THE TYPE CONTAINED IN SELECTED ORDNANCE. THE WORK CALLS FOR SUBSTANTIAL INCREASES IN SENSITIVITY OVER THAT CURRENTLY PROVIDED BY CONVENTIONAL ELECTROMAGNETIC TESTERS AND METAL DETECTORS. INNOVATIVE CONFIGURATIONS OF ELECTROMAGNETIC LEAKAGE FIELD TESTS WILL BE EVALUATED, WHEREIN THE EFFECT OF TARGET EDDY CURRENT LOSSES AND/OR THE EFFECT OF THE TARGET'S MAGNETIC PROPERTIES ON A SEARCH COIL WILL BE MONITORED. SPECIALIZED PROBES WHICH COMBINE LARGE LEVELS OF FIELD INTENSITY AND PENETRATION WITH HIGH SENSITIVITY DIFFERENTIAL DETECTION SCHEMES WILL BE FABRICATED AND TESTED. THE DESIRED OBJECTIVE IS TO DEMONSTRATE FEASIBILITY OF METHODS FOR LOCATING AND CHARACTERIZING SMALL METAL OBJECTS LOCATED AT A MINIMUM OF 20 INCHES FROM THE PROBE.

SIGMA RESEARCH INC
8710 148TH AVE NE
REDMOND, WA 98052
CONTRACT NUMBER:
BILL McDONALD
TITLE:
ULTRASONIC DATA INTERCHANGE STANDARD (UDIS)
TOPIC# 102 OFFICE: NAVAIR

MOST OF THE ULTRASONIC SCANNING SYSTEMS IN SERVICE OR BEING INSTALLED AT DOD FACILITIES OFFER SOME MEANS OF RECORDING INSPECTION DATA. HOWEVER, THE ADVANTAGES OF THIS CAPABILITY AREN'T BEING FULLY REALIZED BECAUSE THE STORAGE MEDIA AND DATA ARCHIVAL FORMATS DIFFER FROM SYSTEM TO SYSTEM. THIS LACK OF STANDARDIZATION IS CAUSING A PROBLEM THAT IS BECOMING WIDESPREAD AS MORE AND MORE DOD FACILITIES INCREASE THEIR USE OF ULTRASONIC SCANNING TECHNOLOGY. SIGMA PROPOSES TO DEVELOP AN ULTRASONIC DATA INTERCHANGE STANDARD (UDIS) THAT WILL PERMIT NAVAL AIR REWORK FACILITIES (NARFs) TO EXCHANGE ULTRASONIC INSPECTION DATA IN THE FORM OF C-SCAN IMAGE FILES. THE OBJECTIVE OF THE STUDY WOULD BE TO DEVELOP HARDWARE (STORAGE MEDIUM) AND INFORMATION EXCHANGE (DATA FORMAT) SPECIFICATIONS REQUIRED TO RETROFIT EXISTING EQUIPMENT AND STANDARDIZE FUTURE SYSTEMS. SIGMA HAS SUPPLIED SOME OF THE NAVY'S NEWEST, MOST ADVANCED ULTRASONIC SCANNING SYSTEMS. ON THIS BASIS, WE FEEL QUALIFIED TO DEFINE APPROPRIATE HARDWARE AND SOFTWARE SPECIFICATIONS AND DEVELOP THE UDIS. OUR APPROACH WOULD BE

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FIRST TO SURVEY THE NARFs THAT OPERATE ULTRASONIC INSPECTION EQUIPMENT AND THEN TO VISIT THE MAJOR SCANNER MANUFACTURERS AND DISCUSS THEIR DATA ARCHIVAL PROCEDURES. AFTER COMPILING THIS INFORMATION, THE UDIS WOULD BE DEVELOPED.

SIMNET
456 COLLEGE AVE
PALO ALTO, CA 94306
CONTRACT NUMBER:
DR DONALD DuBOIS
TITLE·
THE NETWORK ARCHITECTURE SIMULATION SYSTEM (NASS)-AN A
APPROACH TO MODELING DISTRIBUTED ARCHITECTURES
TOPIC# 205 OFFICE: NUSC/NAVSEA

MANY ADVANCED DEFENSE SYSTEMS, UNDER DEVELOPMENT OR IN THE PLANNING STAGES, HAVE DISTRIBUTED COMPUTER/COMMUNICATION ARCHITECTURES AS AN INTEGRAL PART OF THE TOTAL SYSTEM. THE PERFORMANCE OF THESE SOPHISTICATED SYSTEMS SHOULD BE EVALUATED BEFORE THEY ARE BUILT. BECAUSE OF THEIR INCREASING COMPLEXITY SIMULATION MODELS FOR PERFORMANCE EVALUATION OF THESE ARCHITECTURES ARE BECOMING MORE COSTLY TO BUILD AND DEBUG. A NEW SYSTEM - THE NETWORK ARCHITECTURE SIMULATION SYSTEM (NASS) - HAS ADVANCED THE STATE-OF-THE-ART IN BUILDING THESE DISTRIBUTED ARCHITECTURE MODELS (SUCH AS COMMAND AND CONTROL SYSTEMS). THE PROPOSED EFFORT WILL DEVELOP A NASS MODEL OF A COMMAND AND CONTROL DISTRIBUTED ARCHITECTURE. IT WILL BE DRIVEN BY A REALISTIC TEST BED ND USED FOR PARAMETRIC EVALUATION OF CRITICAL PERFORMANCE INDICES IN ORDER TO ESTABLISH ARCHITECTURAL REQUIREMENTS AND/OR EVALUATE CANDIDATE ARCHITECTURES. THE ADVANTAGES OF NASS CAPABILITIES (HIGH LEEL LANGUAGE, EXTENSIVE REPORT GENERATION FEATURES, ETC.) WILL BE DEMONSTRATED. THE TIME REQUIRED TO DEVELOP A SOPHISTICATED MODEL WILL BE MINIMIZED WHILE STILL PROVIDING A FLEXIBLE FRAMEWORK FOR MODEL EXPERIMENTATION.

SINHA S & ASSOCS INC
PO BOX 11205
BURBANK, CA 91510
CONTRACT NUMBER: N60530-88-C-0029
SACH SINHA
TITLE:
AN ACCELERATION DRIVEN TRANSFORMER TYPE ENERGY INTERRU
TOPIC# 170 OFFICE: NWC/NAVAIR

SUBMITTED BY

THIS EFFORT EVALUATES TECHNICAL FEASIBILITY OF AN ACCELERATION DRIVEN TRANSFORMER TYPE ENERGY INTERRUPTOR SYSTEM FOR A GUIDED MISSILE. THE INTERRUPTOR INSURES THAT THE GUIDED MISSILE HAS TRAVELED A SAFE DISTANCE FROM LAUNCH PLATFORM BEFORE ALLOWING THE TRANSFER OF ENERGY FROM THE GUIDED MISSILE BATTERY TO THE FIRING CIRCUITS IN THE S-A DEVICE. THE DEVICE USES A PIEZOELECTRIC ACCELEROMETER TO SENSE THE LAUNCH AND FLIGHT ACCELERATIONS OF THE MISSILE AND A MICROPROCESSOR TO PERFORM DOUBLE INTEGRATION TO CALCULATE THE DISTANCE TRAVELED. A TYPICAL LAUNCH AND FLIGHT PATTERN IS ASSUMED. THE MICROPROCESSOR IS PROGRAMMED TO FUNCTION AS A KEY CONTROLLER AND IT GENERATES A UNIQUE SIGNAL FOR A TRANSFORMER IN THE POWER CIRCUIT WHICH IS ABLE TO RECEIVE THIS UNIQUE SIGNAL AND FUNCTIONS ONLY AFTER THE UNIQUE SIGNAL IS PROPERLY RECEIVED. DURING THE FIRST PHASE OF THE PROGRAM A BREADBOARD MODEL WILL BE DESIGNED FABRICATED, AND TESTED BY COMPUTER SIMULATION.

SOFTWARE CONSULTANTS INTERNATIONAL LTD
10803 KENT KANGLEY RD - STE 204
KENT, WA 98031
CONTRACT NUMBER:
LAWRENCE PETERS
TITLE:
HARD REAL-TIME SOFTWARE DESIGN METHODOLOGY
TOPIC# 125 OFFICE: NSWC

THE EFFORT EXTENDS THE CURRENT REAL-TIME VERSION OF STRUCTURED METHODS OF SOFTWARE DESIGN TO ADDRESS THE SPECIFIC PROBLEM OF HARD REAL-TIME SYSTEMS. EXTENSIONS OF THE NOTATION, PERFORMANCE ESTIMATION ALGORITHMS, AND SUPPLEMENTAL SOFTWARE DESIGN STRUCTUREAL CONCEPTS ARE INCORPORATED TO ACCOMPLISH THIS. EXTENSIVE USE OF ACTUAL EXPERIENCE ON REAL-TIME SYSTEMS AND NEW CONCEPTS ARE EMPLOYED. THE FEASIBILITY OF AUTOMATING THE USE OF THIS METHODOLOGY IS ALSO EXPLORED RESULTING IN A TAILORING OF THE METHODOLOGY TO FACILITATE THIS.

SOFTWARE SYSTEMS DESIGN INC
3627 PADUA AVE
CLAREMONT, CA 91711
CONTRACT NUMBER:
DR THOMAS S RADI
TITLE:
AUTOMATIC CONVERSION OF REAL-TIME SOFTWARE REQUIREMENT
TOPIC# 128 OFFICE: NSWC

SUBMITTED BY

THIS PHASE I EFFORT PROVIDES A DESIGN AND PROTOTYPE TOOLSET FOR A COMPREHENSIVE SET OF SOFTWARE TOOLS WHICH PROVIDES A MECHANISM FOR AUTOMATICALLY CONVERTING AN EXISTING, OR ANY NEWLY SPECIFIED SET OF SOFTWARE REQUIREMENTS, INTO A TOP-LEVEL DESIGN STRUCTURE. THE PHASE I EFFORT WILL CONCENTRATE ON THE DEVELOPMENT OF AN AUTOMATED REQUIREMENTS TO DESIGN METHODOLOGY AND A SET OF TOOLS AND TECHNIQUES TO BE USED ON ADA-BASED DESIGNS AND ADA IMPLEMENTATIONS OF REAL TIME MMCS SOFTWARE APPLICATIONS. THE RESULTING METHODOLOGY WILL BE EQUALLY APPLICABLE TO IMPLEMENTATIONS IN LANGUAGES OTHER THAN ADA.

SOFTWARE SYSTEMS TECHNOLOGY INC
7100 BALTIMORE BLVD - STE 204
COLLEGE PARK, MD 20740
CONTRACT NUMBER:
RANDALL RUSTIN
TITLE:
NON-PROCEDURAL LANGUAGES FOR RAPID SYSTEM PROTOTYPING
TOPIC# 70 OFFICE: NAVSEA

THIS PROPOSAL PRESENTS AN OUTLINE FOR RESEARCH ON THE FEASIBILITY OF DEVELOPING A HIERARCHICAL, NONPROCEDURAL LANGUAGE ARCHITECTURE FOR USE IN RAPID PROTOTYPE DEVELOPMENT AND AUTOMATED DESIGN OF COMPLEX COMPUTER SYSTEMS. THE PROPOSED STUDY WILL CONCENTRATE FIRST ON CLASSIFYING PROTOTYPING SUBLANGUAGES USING A CASE STUDY APPROACH. BASED ON THE TAXONOMY THUS EVOLVED, AN ARCHITECTURE FOR PROTOTYPING LANGUAGES WILL BE PROPOSED. IMPLEMENTATION APPROACH FOR THIS LANGUAGE AS AN EXTENSION OF EXISTING SYSTEMS SUCH AS XDB WILL BE SUGGESTED.

SPACE POWER INC
1977 CONCOURSE DR
SAN JOSE, CA 95131
CONTRACT NUMBER:
J K KOESTER
TITLE:
PULSED LASER RANGING TECHNIQUES FOR ICE
TOPIC# 58 OFFICE: NAVSEA

AN EXPLORATORY INVESTIGATION OF THE PROPAGATION CHARACTERISTICS OF

SUBMITTED BY

LASER LIGHT IN SIMULATED SEA ICE IS PROPOSED. TRANSMISSION AND REFLECTION BEHAVIOR WILL BE MEASURED SO THAT THE POTENTIAL OF A NEW CLASS OF ICE THICKNESS AND PROFILING DIAGNOSTICS CAN BE ASSESSED. DUE TO SEA ICE INHOMOGENEITIES, AN EXPERIMENTALLY ORIENTED PROGRAM USING A POWERFUL PULSED Nd:YAG LASER IS PROPOSED. USING NANOSECOND PULSES, A VARIETY OF LASER RANGING INSTRUMENTS BASED ON TIME-OF-FLIGHT ENHANCED BY TRIANGULATION TECHNIQUES COULD BE DEVELOPED. EXPERIMENTS WITH SIMULATED SEA ICE PROBED BY 50 MW PULSES OF 6 NANOSECOND DURATION AT A WAVELENGTH IN THE BLUE-GREEN TRANSMISSION BAND ARE OUTLINED. THE OPTICAL DATA WILL BE USED TO ASSESS POTENTIAL OPERATIONAL LIMITS FOR LASER BASED RANGING INSTRUMENTATION. SATISFACTORY OPTICAL PERFORMANCE WOULD LEAD TO IN-SITU MEASUREMENTS OF ARCTIC SEA ICE.

SPARTA INC
PO BOX 1354 - 1055 WALL ST/STE 200
LA JOLLA, CA 92038
CONTRACT NUMBER:
DR K J CHEVERTON
TITLE:
CRITICAL STRAIN ENERGY DENSITY AS A FRACTURE MECHANICS
TOPIC# 73 OFFICE: NAVSEA

SPARTA, INC. PROPOSES A PROGRAM TO EVALUATE THE CRITICAL STRAIN ENERGY DENSITY (CSED) AS A FRACTURE CRITERION. THE OBJECTIVES OF THE PHASE I PROGRAM ARE TO PERFORM A PRELIMINARY TEST AND ANALYSIS PROGRAM TO DETERMINE IF A COMPREHENSIVE TEST PROGRAM TO INVESTIGATE CSED HAS MERIT AND THEN, ASSUMING CSED SHOWS PROMISE, DESIGN A COMPREHENSIVE PHASE II PROGRAM. THE PHASE I APPROACH WILL INCLUDE 1) PURCHASE AND UNIAXIAL TEST OF REPRESENTATIVE STEELS PLATES, 2) ANALYTICAL SIMULATIONS OF FRACTURE TESTS INCLUDIG THE EFFECTS OF LARGE STRAINS AND GROSS YIELDING, 3) CHARPY IMPACT AND J(IC) TESTING OF THE SELECTED STEELS, 4) CORRELATION OF THE UNIAXIAL TEST RESULTS WITH RESULTS FROM CHARPY IMPACT AND J(IC), AND 5) PLANNING OF PHASE II TEST PROGRAM.

SPARTA INC
PO BOX 1354 - 1055 WALL ST/STE 200
LA JOLLA, CA 92038
CONTRACT NUMBER:
JOEL M ZUIEBACK
TITLE:
TUNED TACTICAL ROCKET MOTOR CASES FOR INSENSITIVE MUNI
TOPIC# 174 OFFICE: NWC/NAVSEA

SUBMITTED BY

PROPELLANT TECHNOLOGY HAS EVOLVED TO PRODUCE MORE ENERGETIC PROPELLANTS FOR NAVY TACTICAL MISSILES. THE IMPETUS FOR THIS EVOLUTION IS FLEET DEFENSE WHERE THERE IS A PAY-OFF FOR HIGHER THRUST/WEIGHT ROCKET MOTORS WHICH WILL RESULT IN MORE RANGE AND/OR LESS TIME-TO-TARGET. HOWEVER THERE IS AN INCREASED DETONATION HAZARD ASSOCIATED WITH THESE MORE ENERGETIC PROPELLANTS WHICH RESULTS IN HIGHER LEVELS OF RISK TO PERSONNEL AND EQUIPMENT REQUIRED TO TRANSPORT, STORE, AND HANDLE THESE MUNITIONS. IN ADDITION, THE HIGHER HAZARD LEVELS ASSOCIATED WITH THESE MUNITIONS MAY REDUCE THE BENEFITS ASSOCIATED WITH MAXIMIZING THE SHIPBOARD STORAGE/STOWAGE CAPACITY OF MUNITIONS AND THE BENEFIT IN MORE FLEXIBLE MUNITION STORAGE SCENARIOS ACHIEVED BY MAINTAINING THE MUNITIONS CLOSE TO THE LAUNCHER VEHICLES. THIS EFFORT WILL DEFINE A DESIGN METHODOLOGY FOR THE DEVELOPMENT OF TUNED ROCKET MOTOR CASES WHICH MITIGATE THE PEAK SHOCK PRESSURES WHICH LEAD TO PROMPT INITIATION OF PROPELLANTS.

SPECIALTY PLASTICS INC
15915 PERKINS RD
BATON ROUGE, LA 70810
CONTRACT NUMBER:
RICHARD H LEA
TITLE:
COMPOSITE PIPING SYSTEMS
TOPIC# 248 OFFICE: DTNSRDC

A COMBINED EXPERIMENTAL AND ANALYTICAL STUDY IS PLANNED TO DEVELOP ADVANCED COMPOSITE PIPING SYSTEMS. DUAL WALL PIPE WILL BE DEVELOPED AND TESTED FOR IMPROVED IMPACT RESISTANCE AND TOUGHNESS. EPOXY AND POLYESTER RESINS WILL BE USED IN COMPOSITE PIPE SECTIONS AND BONDED WITH EPOXY ADHESIVES AS WELL AS WITH HEAT-SHRINKABLE ULTRA HIGH MOLECULAR WEIGHT POLYETHYLENE AND ADVANCED ELASTMERIC COUPLINGS AND TESTED BENDING AND TORSION AT TEMPERATURES TO 300 DEG F UNDER INTERNAL PRESSURE. COMMERCIALLY AVAILABLE ENDOTHERMIC AND FIRE RETARDANT BLANKETS WILL BE INCORPORATED IN COMPOSITE PIPE SYSTEMS TO BE TESTED AND EVALUATED TO MEET STRINGENT FIRE/SMOKE/TOXICITY REQUIREMENTS. AN ASSESSMENT OF GRAPHITIZED CARBON FIBERS, WHICH HAS BEEN SUCCESSFULLY USED IN EXPERIMENTS FOR ELECTRICAL POWER TRANSMISSION, WILL BE PERFORMED, ESPECIALLY FOR USE IN FUEL PIPING APPLICATIONS. SIMPLE MODELS WILL BE CONSTRUCTED TO ESTABLISH THE COMPUTER OPTIMIZATION SCHEME OF

SUBMITTED BY

THE PIPING PROPERTIES, THE GOVERNING EQUATION FOR THE SYSTEM PERFORMANCE, AND THE EMPIRICAL EQUATIONS FOR THE COMPOSITE PIPING BEHAVIOR. THE PRIMARY OBJECTIVE IS TO PROVIDE DESIGN DATA FOR THE DEVELOPMENT OF A STRONG, LIGHTWEIGHT, EASY TO INSTALL AND REPAIR, COMPOSITE PIPE SYSTEM TO REPLACE EXOTIC ALLOYS USED IN CORROSIVE APPLICATIONS.

SPECTRASCAN INC
45 S SATELLITE RD
SOUTH WINDSOR, CT 06074
CONTRACT NUMBER:
MILTON STOLLER
TITLE:
A LARGE AREA X-RAY SENSITIVE VIDEO TUBE FOR NON-DESTRU
TOPIC# 135 OFFICE: NSWC

THIS PROPOSAL IS FOR X-RAY RADIOLOGICAL IMAGING OF OBJECTS IMPORTANT TO THE NAVY WHICH REQUIRE: X-RAY ENERGIES IN THE RANGE OF 1-10 MeV; LARGE AREAS TO BE IMAGED; EXCELLENT SPATIAL RESOLUTION WITH WIDE DYNAMIC RANGE; A VIDEO SIGNAL READ-OUT FOR INJECTION INTO A DIGITAL IMAGE ACQUISITION, PROCESSING, DISPLAY AND ARCHIVAL STORAGE SYSTEM; EXPOSURES FOLLOWED BY READ-OUT WITHOUT THE NEED FOR CHANGING THE POSITION OF THE IMAGING DEVICE. A LARGE AREA, X-RAY SENSITIVE VIDEO TUBE IS PROPOSED TO MEET THESE REQUIREMENTS BASED ON USING DISPLAY ELECTRON-OPTICS WITH ITS VERY HIGH VELOCITY ELECTRON BEAM. IT AVOIDS THE INTRINSIC LIMITATIONS OF THE CONVENTIONAL LOW VELOCITY TUBE WHICH HAVE PREVENTED IT FROM BEING USED IN LARGE AREA APPLICATIONS FOR RADIOLOGY. PHASE I REQUIRES A THEORETICAL ANALYSIS TO DEMONSTRATE FEASIBILITY OF; 1. A MODEL BASED ON THE MECHANISMS OF DEVICE OPERATION. 2. THE AVAILABILITY OF MATERIALS FOR (AND STRUCTURE OF) A SENSOR-TARGET. 3. THE DESIGN OF A TUBE FOR A REPRESENTATIVE NAVAL NDT APPLICATION.

SPIRE CORP
PATRIOTS PK
BEDFORD, MA 01730
CONTRACT NUMBER:
BRIAN W MURRAY
TITLE:
A NEW METALLIC LIGHT ABSORBING DURABLE OPTICAL BAFFLE
TOPIC# 120 OFFICE: NSWC

SUBMITTED BY

SPIRE CORPORATION PROPOSES TO DEVELOP AN OPTICAL BAFFLE MATERIAL THAT IS METALLIC, LIGHT ABSORBING, RADIATION-HARDENED AND DURABLE. USING A SPIRE DEVELOPED PROCESS, INITIAL EXPERIMENTS HAVE DEMONSTRATED THAT A STRUCTURED Be SPUTTERED LAYER CAN BE DEPOSITED ON PROPERLY PREPARED Be SUBSTATES. THE STRUCTURE IS IN THE FORM OF LIGHT ABSORBING SPIRES WITH HIGH ASPECT RATIOS. OPTIMIZATION OF THE PROCESS WILL BE PERFORMED ON 1-INCH DIAMETER COUPONS WITH COMPLETE CHARACTERIZATION OF EACH PROCESS STEP. THE SPIRE BAFFLE MATERIAL WILL BE CHARACTERIZED AND COMPARED TO AVAILABLE BAFFLE MATERIALS USING BRDF MEASUREMENTS AND SIMULATIONS OF THE EFFECTS OF RAM OXYGEN AND MICROMETEORITE SHOWERS. SCALING UP THE DEVELOPED PROCESS TO SYSTEM-SIZED BAFFLE COMPONENTS WILL BE PROPOSED IN PHASE II USING COMMERCIALLY AVAILABLE EQUIPMENT.

STAC INC
950 E COLORADO BLVD
PASADENA, CA 91106
CONTRACT NUMBER:
GARY W CLOW
TITLE:
RAPID PROTOTYPING USING SILICON COMPLICATION AND PROGR
LOGIC DEVICES
TOPIC# 176 OFFICE: NWC/DNT

IT HAS BEEN SHOWN THAT HARDWARE EMULATORS ENJOY A PERFORMANCE ADVANTAGE OF APPROXIMATELY THREE TO SIX ORDERS OF MAGNITUDE OVER SOFTWARE SIMULATORS. DESIGNERS WHO ARE ENGAGED IN THE DESIGN OF REAL-TIME EMBEDDED COMPUTER SYSTEMS COULD GREATLY BENEFIT FROM THE PERFORMANCE ADVANTAGE OF HARDWARE-BASED RAPID PROTOTYPING. OUR APPROACH INVOLVES AN INNOVATIVE WAY OF COMBINING TWO NEW AND EMERGING TECHNOLOGIES, SILICON COMPILATION AND PROGRAMMABLE LOGIC DEVICES (PLDS). IN THE VERY NEAR FUTURE, PLDS CONTAINING 10,000 EQUIVALENT GATES WILL BE COMMERCIALLY AVAILABLE. THE AVAILABILITY OF SUCH DEVICES IN CONJUNCTION WITH SILICON COMPILATION TECHNOLOGY LEADS TO NEW POSSIBILITIES IN RAPID PROTOTYPING OF DIGITAL SYSTEMS. THE GOAL OF OUR RESEARCH AND DEVELOPMENT EFFORT IS TO PRODUCE A SILICON COMPILER WITH A RETARGETABLE BACK END WHICH CAN SUPPORT RAPID PROTOTYPING UTILIZING VERY LARGE PLDS. THE COMPILER WILL ALSO SUPPORT GATE ARRAY AND STANDARD CELL DESIGN SO THAT THE DESIGN CAN QUICKLY AND EASILY

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BE MOVED INTO COST-EFFECTIVE VOLUME PRODUCTION.

SUNOL SCIENCES CORP
6400 VILLAGE PKWY
DUBLIN, CA 94568
CONTRACT NUMBER:
PETER C STUDT
TITLE:
A COMPACT DYNOMOMETER FOR TURBOSHAFT ENGINES
TOPIC# 258 OFFICE: NAVAIR/NATC

THE FEASIBILITY OF A NON-INTRUSIVE DYNOMOMETER (NID) FOR PERFORMANCE TESTING OF TURBOSHAFT ENGINES IS ASSESSED. THE NEW TECHNIQUE INVESTIGATED IS POTENTIALLY THE MOST ECONOMICAL, COMPACT AND EFFICIENT OF ALL METHODS FOR MEASURING TORQUE. BEING COMPACT AND LIGHT WEIGHT, IT IS IDEAL FOR ON-WING OR ON-THE-AIRCRAFT APPLICATION. THE TORQUE OF ANY ROTATING ENGINE CAN BE MEASURED DIRECTLY FROM PRIMARY ENGINE CHARACTERISTICS AS OPPOSED TO INTERPRETATION OF AN INTERMEDIATE EFFECT SUCH AS STRAIN. APPLICATION OF THIS TECHNIQUE TO THE T-56-427 ENGINE IS ASSESSED, AND A PROTOTYPE DESIGN IS DEVELOPED.

SUPER/RADIANT SYSTEMS INC
PO BOX 370
CONWAY, MA 01341
CONTRACT NUMBER:
DR LAWRENCE DOMASH
TITLE:
NOVEL FILTER FABRICATION METHOD FOR OPTICAL PATTERN RE
TOPIC# 160 OFFICE: NSWC

OPTICAL PATTERN RECOGNISTION BY MATCHED FILTERING IS IMPORTANT FOR MILITARY TARGET IDENTIFICATION AND INDUSTRIAL ROBOT VISION. LOW COST SPATIAL LIGHT MODULATORS HAVE BROUGHT THE TECHNIQUE CLOSER TO PRACTICAL USE BUT A BOTTLENECK REMAINS IN METHODS TO COMPUTER SYNTHESIZE HIGH QUALITY FOURIER PLANE MATCHED FILTERS EFFICIENTLY AND CHEAPLY. RECENT RESEARCH HAS DEMONSTRATED THAT THE BINARY PHASE-ONLY FILTER IS THE METHOD OF CHOICE. WE PROPOSE A NOVEL METHOD TO PRODUCE THE MASKS TO FABRICATE SUCH FILTERS BY MEANS OF LOW COST LASER PRINTERS WHICH

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HAVE RECENTLY BECOME AVAILABLE FOR MICROCOMPUTERS. PHASE I RESEARCH WILL DEMONSTRATE THAT PRODUCTION OF BINARY FILTERS WITHE 2400 X 2400 PIXELS OF FEATURE SIZE 5 MICROMETER IS FEASIBLE USING EQUIPMENT COSTING ONLY A FEW THOUSAND DOLLARS AND 20,000 X 20,000 PIXEL FILTERS OR COMPUTER GENERATED HOLOGRAMS WITH FEATURE SIZE 1-5 MICROMETERS ARE POSSIBLE WITH WIDELY AVAILABLE INDUSTRIAL DEVICES. THE LASER PRINTERS TO BE USED ARE DRIVEN BY A UNIVERSAL GRAPHIC DESCRIPTION COMPUTER LANGUAGE, POSTSCRIPT. PHASE I RESEARCH WILL EXAMINE THE BEST WAYS TO UTILIZE POSTSCRIPT AND POSTSCRIPT COMPATIBLE LASER PRINTERS FOR COMPUTER SYNTHESIS OF MATCHED FILTERS AND OTHER NOVEL APPLICATIONS IN OPTICAL SIGNAL PROCESSING.

SURFACE OPTICS CORP
9929 HIBERT ST - STE C
SAN DIEGO, CA 92131
CONTRACT NUMBER:
ZU-HAN GU
TITLE:
AN INCOHERENT HOLOGRAPHIC CORRELATOR (FOR REALTIME CLA
OF STOCHASTIC IMAGES)
TOPIC# 160 OFFICE: NSWC

AN INCOHERENT OPTICAL CORRELATOR, USING A COLOR TV MONITOR AND HOLOGRAPHIC SPECTRAL-SPATIAL FILTERS, WAS RECENTLY USED TO DEMONSTRATE REAL TIME COLOR PATTERN RECOGNITION. THE SPECTRAL-SPATIAL FILTERS WERE DESIGNED USING A LEAST-SQUARES LINEAR MAPPING TECHNIQUE TO COMPENSATE FOR THE SMEARING EFFECTS CAUSED BY THE FINITE SPECTRAL BANDWIDTH OF THE LIGHT OUTPUT OF THE CRT. THE EXPERIMENT DEMONSTRATED THAT THESE SPECTRAL-SPATIAL FILTERS PROVIDE BETTER RECOGNITION RELIABILITY THAN SPATIAL FILTERS ALONE. THE OVERALL PURPOSE OF THE PROPOSED PROGRAM IS TO PROVIDE A SIMPLE, ECONOMICAL, INCOHERENT PROCESSOR SYSTEM FOR REAL TIME IMAGE IDENTIFICATION AND CLASSIFICATION. THIS TYPE OF SYSTEM WILL BE APPLICABLE FOR USE IN RECOGNIZING COLOR IMAGES, PSEUDO-COLOR INFRARED IMAGES AND COLOR CODED IMAGES. IT WILL BE DESIGNED IN A COMPACT FORM SUITABLE FOR SUBSEQUENT MANUFACTURE AND WILL UTILIZE COMMERCIALLY AVAILABLE COMPONENTS. THE MAJOR PHASE I TASKS WILL BE: THE DEVELOPMENT OF AN IMAGE DATA BASE; THE DESIGN OF THE SPECTRAL-SPATIAL FILTER FOR PROCESSING WITH INCOHERENT LIGHT; THE ANALYSIS OF THE INFORMATION PROCESSING

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CAPABILITIES OF THE FILTER; AND THE DESIGN AND PERFORMANCE ANALYSIS OF THE COMPLETE IDENTIFICATION SYSTEM. DURING PHASE II, THE SPECTRAL-SPATIAL FILTER WILL BE BUILT USING COMPUTER GENERATED ELECTRON-BEAM HOLOGRAMS, THE SYSTEM WILL BE TESTED AND DEMONSTRATED AND ITS PERFORMANCE ANALYZED AND COMPARED TO PREDICTED PERFORMANCE.

SYMETRIX CORP
215 E SUNBIRD CLIFFS LN
COLORADO SPRINGS, CO 80907
CONTRACT NUMBER:
CARLOS PAS de ARAUJO
TITLE:
RESEARCH ON NONVOLATILE FERROELECTRIC RAMs
TOPIC# 140 OFFICE: NSWC

MEASUREMENTS OF THE HYSTERESIS CHARACTERISTICS AND SWITCHING KINETICS WILL BE MADE ON THREE FERROELECTRIC THIN-FILM MEMORY MATERIALS: LEAD GERMANATE WITH 0 TO 10% SILICON (Pb[5]Ge[3-X]Si[X]O[11]); BISMOTH TITANATE (Bi[4]Ti[3]O[12]); AND POTASSIUM NITRATE (KNO[3]). EMPHASIS WILL BE PLACED IN DETERMINING THE RATE-LIMITING PARAMETER FOR SWITCHING (E.G., SIDEWAYS DOMAIN WALL SPEED IN THE CASE OF KNO[3]), DEPENDENCE OF SWITCHING TIMES UPON FILM THICKNESS, CELL AREA, AND EXTERNAL LOAD. IN KNO(3) IT IS KNOWN THAT THERE IS A MINIMUM IN THE DEPENDENCE OF SWITCHING VOLTAGE UPON THICKNESS WITH A THICKNESS WINDOW OF 65 TO 800 nm OVER WHICH SWITCHING VOLTAGES LIE BELOW A 4.5V (THE STANDARD TTL/CMOS LOGIC LEVELS FOR SILICON INTEGRATED CIRCUITS). THIS THICKNESS DEPENDENCE WILL BE DETERMINED FOR Pb(5)Ge(3-X)Si(X)O(11) AND Bi(4)Ti(3)O(12) IN THE PRESENT WORK. IN THE CASE OF THE LEAD GERMANATE ALLOYS, THE ADDITION OF SILICON IS PROPOSED TO ELIMINATE (OR AT LEAST MINIMIZE) THE PROBLEM OF LEAKAGE CURRENT IN THE MEMORY CELLS. FATIGUE STUDIED WILL BE MADE WITH EMPHASIS UPON THE THEORETICAL MODEL OF SROLOVITZ. SWITCHING TIMES DEMONSTRATED BY THE PRINCIPAL INVESTIGATORS OF THIS PROPOSAL FOR KNO(3) THIN-FILM MEMORIES ARE ALREADY NEARLY WITHIN THE LIMITS REQUESTED IN THE PROGRAM DESCRIPTION: 1.6 TO 1.8V THRESHOLD AND A 20 ns SWITCHING TIME AT 6 TO 9V.

SYMETRIX CORP
215 E SUNBRID CLIFFS LN
COLORADO SPRINGS, CO 80907
CONTRACT NUMBER: N00164-87-C-0240
ROBERT VENES
TITLE:
DEVELOPMENT OF KNO(3) FERROELECTRIC MEMORIES
TOPIC# 187 OFFICE: NWSC/SSPO

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WE HAVE FABRICATED POTASSIUM NITRATE FERROELECTRIC MEMORIES IN THE FORM OF 32 X 32 CELL ARRAYS ON GLASS SUBSTRATES (1Kb) AND MEASURED THEIR SWITCHING TIMES AND READ WRITE CHARACTERISTICS. THE THINNEST KNO(3) FILMS TESTED (75nm) YIELD 20 ns READ-WRITE TIMES AND HIGH BREAKDOWN VOLTAGES (17V). MINIMUM ADDRESS VOLTAGES OF 1.6V ARE ACHIEVED AT 150 nm THICKNESS. A THICKNESS WINDOW FROM 65 TO 800 nm IS COMPATIBLE WITH 4.5V STANDARD SILICON LOGIC LEVELS (TTL-CMOS). NEUTRON HARDNESS TO 5 X 10 TO THE 13TH POWER HAS BEEN MEASURED FORM SOME FILMS. WE WILL FABRICATE A NUMBER OF 1Kb ARRAYS AND STUD THE PROCESSING PARAMETERS THAT INFLUENCE FATIGUE LIMITS. WE HAVE RECENTRLY DISCOVERED THAT A SINGLE 10V "RESTORE" PULSE RETURNS THE KNO(3) MEMORIES TO A STATE VERY NEAR THAT OF VIRGIN DEVICES. RELATED ELECTRICAL REMEDIES FOR FATIGUE/ENDURE PROBLEMS WILL BE ANALYZED UNDER THE PROPOSED WORK, TOGETHER WITH CHEMICAL APPROACHES INVOLVING DOPANTS.

SYNETICS CORP
80 MAIN ST
READING, MA 01867
CONTRACT NUMBER:
R A FASTRING
TITLE:
STANDARD BACKPLANE BUSSES FOR NAVY TACTICAL HARDWARE
TOPIC# 69 OFFICE: NAVSEA

FOR SEVERAL YEARS, THE COMMERCIAL COMPUTER/PERIPHERAL MARKET HAS SIGNIFICANTLY BENEFITED THROUGH THE CONCEPT OF AN "OPEN ARCHITECTURE" WHICH IS BASED UPON THE USE OF STANDARDIZED AND WIDELY PUBLISHED BACKPLANE BUSSES. THROUGH BACKPLANE STANDARDIZATION, MANUFACTURERS HAVE BEEN ABLE TO BRING NEW PRODUCTS RAPIDLY FROM THE LABORATORY TO PRODUCTION. THE COST OF COMPUTER AND PERIPHERAL EXPANSION FUNCTIONS (MODEMS, MEMORY BOARDS, VIDEO BOARDS, CPU BOARDS, ETC.) HAS DROPPED SIGNIFICANTLY DUE TO MULTIPLE VENDOR COMPETITION. THIS SBIR PROPOSAL OFFERS TO THE U.S. NAVY A MEANS BY WHICH THESE SAME ADVANTAGES CAN BE EXPLOITED IN NAVAL MILITARY HARDWARE WITHOUT SACRIFICING THE ABILITY TO RETAIN CONTROL OF THE END PRODUCT FROM A CONFIGURATION MANAGEMENT POINT OF VIEW.

SYNETICS CORP
80 MAIN ST
READING, MA 01867
CONTRACT NUMBER:
J ORGAN
TITLE:
SHORT RANGE COMMUNICATIONS
TOPIC# 196 OFFICE: NUSC

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THIS PROPOSAL PROVIDES A NOVEL AND INNOVATIVE SOLUTION TO THE PROBLEM OF SHORT RANGE (UP TO 1000 YARDS) UNDERWATER COMMUNICATION UNDER VARIABLE SOUND PROPAGATION CONDITIONS. THE PROPOSED CONCEPT IS TO ADAPT THE FREQUENCY MODULATION FEEDBACK (FMFB) PRINCIPLE WHICH HAS BEEN WELL PROVEN IN MICROWAVE RADIO TRANSMISSION TO THE UNDER-WATER ACOUSTIC ENVIRONMENT. AT THE TRANSMITTER, A WIDEBAND HIGH DE-VIATION RATIO ACOUSTIC SIGNAL -- AT A HIGH CARRIER FREQUENCY -- WILL BE PROJECTED INTO THE WATER AND RECEIVED BY A SUPERHETERODYNE ACOUSTIC RECEIVER WITH A WIDEBAND "FRONT END". HOWEVER, A LOCAL OSCILLATOR CONSISTING OF A VOLTAGE CONTROLLED OSCIALLATOR (VCO) WHOSE VOLTAGE INPUT IS A FEEDBACK SIGNAL FROM THE FM-DETECTED WAVEFORM WILL PRODUCE A NARROWBAND INTERMEDIATE FREQUENCY (IF). THE WIDEBAND FRONT-END WILL HELP TO OVERCOME ACOUSTIC PROPAGATION ANOMALIES, WHEREAS THE NARROWBAND IF WILL RESULT IN GOOD THRESHOLD CHARACTERISTICS.

SYSTEMS & SECURITY TECHNOLOGY CORP
1 HORSESHOE CIR
FREDERICKSBURG, VA 22405
CONTRACT NUMBER:
GARY W KINCAID
TITLE:
VOICE PROGRAMMING
TOPIC# 41 OFFICE: SPAWAR

THIS RESEARCH AND DEVELOPMENT INVOLVES RESEARCH INTO THE USE OF VOICE AS AN INPUT AND CONTROL MEDIA TO INCREASE THE PRODUCTIVITY OF PROGRAMMERS. AN EXPERIMENTAL SOFTWARE DEVELOPMENT ENVIRONMENT WILL BE CONSTRUCTED USING A VOICE RECOGNIZATION DEVICE ATTACHED TO A COMPUTER WORKSTATION. EXPERIMENTS WILL BE CONDUCTED TO ELIMINATE THE STYLIZED INPUT ASSOCIATED WITH KEYBOARD EMULATION STRATEGY OF VOICE INPUT. VISUAL RESPONSE TECHNIQUES WILL THEN BE TESTED FOR MAN-MACHINE INTERFACE CONTROL. FINALLY AN ADA SYNTAX-DIRECTED EDITOR WILL BE CONTROLLED BY VOICE WITH GRAPHIC SUPPORTED RESPONSE.

SYSTEMS ENGINEERING INC
7833 WALKER DR - STE 308
GREENBELT, MD 20770
CONTRACT NUMBER:
NABAJYOTI BARKAKATI
TITLE:
SEA MULTIPATH MODELS FOR TRACKING RADARS
TOPIC# 164 OFFICE: JCMPO

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SEA SURFACE MULTIPATH DRASTICALLY AFFECTS THE PERFORMANCE OF TRACKING RADARS IN THE LOW GRAZING ANGLE SCENARIOS COMMON IN NAVAL OPERATIONS. TWO SEA MULTIPATH MODELS ARE PROPOSED -- ONE PHENOMENOLOGICAL AND THE OTHER A DETAILED ANALYTICAL SYNTHESIS OF SEVERAL TECHNIQUES. WE PROPOSE TO ENHANCE THE ANALYTICAL MODEL STARTING FROM A PROTOTYPE SYSTEM (DECOM) DEVELOPED EARLIER BY SEI, AND COMPARE ITS PERFORMANCE RELATIVE TO AVAILABLE DATA AND THE APPROPRIATE FEATURES OF THE PHENOMENOLOGICAL MODEL.

SYSTEMS EXPLORATION INC
4141 JUTLAND DR
SAN DIEGO, CA 92117
CONTRACT NUMBER: M00027-87-C-0062
LEE R MARSH
TITLE:
TACTICAL WARFARE SIMULATION EVALUATION AND ANALYSIS SY
AVIATION SYSTEM INTERFACE
TOPIC# 27 OFFICE: MARINE CORPS

PREPARED AN INTERFACE REQUIREMENTS SPECIFICATION FOR EMPLOYMENT OF THE TACTICAL WARFARE SIMULATION, EVALUATION, AND ANALYSIS SYSTEM WITH CURRENT AND PROJECTED AUTOMATED COMMAND AND CONTROL SYSTEMS SUPPORTING THE MARINE AIR WING AT THE MARINE AMPHIBIOUS BRIGADE AND FORCE LEVELS. THIS DOCUMENT WILL DESCRIBE INFORMATION EXCHANGE REQUIREMENTS FROM A FUNCTIONAL STANDPOINT, IDENTIFYING THE TYPE OF INFORMATION TO BE PASSED BETWEEN THE SYSTEMS, THE QUANTITY OF DATA TO BE TRANSFERRED, AND APPROPRIATE POINTS OF CONNECTIVITY BETWEEN THE SYSTEMS. BOTH AUTOMATED AND MANUAL INTERFACE METHODOLOGIES MAY BE DESCRIBED TO MEET THE INFORMATION EXCHANGE REQUIREMENTS. THE DOCUMENT WILL ALSO ADDRESS ISSUES PERTAINING TO THE USE OF TWSEAS TO MEET TRAINING OBJECTIVES, THEREBY PROVIDING GUIDELINES FOR EXERCISE PLANNERS AND CONTROLLERS IN SUCH AREAS AS DATA BASE INITIALIZATION, EXERCISE CONDUCT, AND EXERCISE EVALUATION. THE PROPOSED EFFORT WILL INVOLVE ANALYSIS OF CURRENT AND PROJECTED AIR COMMAND AND CONTROL SYSTEMS, IN TERMS OF BOTH HARDWARE AND SOFTWARE DESIGNS, TOGETHER WITH AN EXAMINATION OF CURRENT AND PROJECTED TWSEAS CAPABILITIES IN ORDER TO DETERMINE THE MOST EFFECTIVE MEANS OF PROMOTING AND OBTAINING INTEROPERABILITY AMONG THESE SYSTEMS IN AN EXERCISE ENVIRONMENT.

SYSTEMS TECHNOLOGY INC
2672 BAYSHORE PKWY - STE 505
MOUNTAIN VIEW, CA 94043
CONTRACT NUMBER:
WARREN F CLEMENT
TITLE:
REAL-TIME FORECASTING OF FUTURE SHIP MOTION
TOPIC# 207 OFFICE: NAEC/NAVAIR

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THE DESIGN, DEVELOPMENT, AND IMPLEMENTATION OF A REAL-TIME METHOD TO FORECAST FUTURE QUIESCENT INTERVALS IN SHIP MOTION IS PROPOSED FOR V/STOL AIRCRAFT RECOVERY OPERATIONS ABOARD AIR-CAPABLE SHIPS. THE METHOD USES ONLY MEASURED SHIP MOTIONS AND PROVIDES A RATIONAL BASIS IN TIME-OPTIMAL CONTROL THEORY FOR ESTABLISHING REQUISITE FORECASTING INTERVALS. THE FORECASTING TECHNIQUE IS BASED ON CONTINUOUS REAL-TIME IDENTIFICATION OF THE SINUSOIDAL AMPLITUDES AND PHASE ANGLES IN THE RANGE OF FREQUENCIES THAT CHARACTERIZE THE ENCOUNTERED MODAL PERIOD OF MOTIONS, REPEATED SAMPLING OF SHIP MOTIONS, AND FAST-TIME INTEGRATION OF SEVERAL HIGHER DERIVATIVES OF MOTION COUPLED WITH MEASURED INITIAL CONDITIONS. THE MOTION FORECAST METHOD HAS BEEN VALIDATED IN THE LABORATORY IN REAL TIME WITH RECORDED TIME HISTORIES OF ACTUAL SHIP MOTIONS. THE NECESSARY SHIP MOTION MEASURING TECHNIQUES, SENSORS, AND COMPUTER PROGRAMS FOR OPERATIONAL REAL-TIME SHIP MOTION FORECASTING ARE DESCRIBED. A PROGRAM IS PROPOSED FOR ASSESSING THE ACCURACY OF THE FORECASTING AS A FUNCTION OF THE PREDICTION INTERVAL, THE ACCURAY OF THE ESTIMATED SINUSOIDAL AMPLITUDES AND PHASE ANGLES IN THE RANGE OF FREQUENCIES THAT CHARACTERIZE THE ENCOUNTERED MODAL PERIOD, AND THE ACCURACY OF THE SENSED AND SAMPLED SHIP MOTIONS.

SYSTOLIC SYSTEMS INC
1065 E BROKAW RD
SAN JOSE, CA 95131
CONTRACT NUMBER:
RICHARD H TRAVASSOS
TITLE:
SOFTWARE ENGINEERING ENVIRONMENT FOR PARALLEL AND DIST SYSTEMS
TOPIC# 158 OFFICE: NSWC

FUTURE GENERATIONS OF NAVY COMBAT SYSTEMS WILL DEPLOY PARALLEL AND/OR DISTRIBUTED PROCESSING ARCHITECTURES. SYSTEM DESIGN AND, IN PARTICULAR, SOFTWARE DESIGN AND PROGRAMMING FOR THESE ENVIRONMENTS WILL BE ORDERS OF MAGNITUDE MORE DIFFICULT THAN ANYTHING WE FACE NOW. THE PROPOSED EFFORT, THEREFORE, ASSESSES CURRENT CAPABILITIES FOR ARCHITECTURE EVALUATION, VECTORIZING COMPILERS AND AUTOMATIC CODE GENERATION. FEASIBILITY OF CREATING A SOFTWARE ENGINEERING ENVIRONMENT FOR THE DEVELOPMENT OF PARALLEL AND DISTRIBUTED REAL-TIME SOFTWARE IS ALSO INVESTIGATED. THE PROPOSED SOFTWARE ENVIRONMENT INCLUDES SOFT-

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WARE REQUIREMENTS, FUNCTIONAL DECOMPOSITION (I.E. VECTORIZATION) PROGRAM DESIGN AND AUTOMATIC CODE GENERATION VIA AN EXPERT SYSTEM. THE ADA LANGUAGE WILL BE STUDIED FOR INCLUSION IN THE SOFTWARE ENVIRONMENT, AS WELL AS, NEXT GENERATION PARALLEL PROCESSING HARDWARE SO THAT CODE DEVELOPMENT FOR PARALLEL COMPUTERS CAN BE AS AUTOMATIC AS POSSIBLE.

TAU CORP
485 ALBERTO WY - BLDG D
LOS GATOS, CA 95030
CONTRACT NUMBER:
NICHOLAS PEKELSMA
TITLE:
MORE EFFECTIVE NAVIGATION MODEL FOR INTERDICTION OF EV
TOPIC# 65 OFFICE: NAVSEA

THIS PROPOSAL IS FOR THE DESIGN OF AN EFFECTIVE NAVIGATION LAW FOR INTERDICTING EVASIVE TARGETS, PRINCIPALLY TORPEDOES. INCLUDED IN THE PROPOSED EFFORT IS THE ASSEMBLY OF EXISTING GOVERNMENT-FUNDED TORPEDO AND TARGET-ORIENTED SIMULATIONS FOR THE PURPOSE OF EVALUATING THE NAVIGATIONAL LAW. A KEY BY-PRODUCT OF THIS EFFORT WILL BE THE EVOLUTION OF A PRELIMINARY DESIGN TOOL FOR EVALUATING THE OVERALL PERFORMANCE OF CANDIDATE SYSTEMS WHICH MIGHT EMPLOY THE NAVIGATION LAW. THIS TOOL WILL BE EMPLOYED TO DETERMINE PERFORMANCE REQUIREMENTS AS A FUNCTION OF ENGAGEMENT GEOMETRY, ESTABLISH THE NAVIGATION SYSTEM IMPACT UPON KEY SYSTEM DESIGN ISSUES, AND DEVELOP CANDIDATE NAVIGATION ALGORITHMS CAPABLE OF BEING EMPLOYED WITHIN THE SYSTEM DEFINITION.

TAU CORP
485 ALBERTO WY - BLDG D
LOS GATOS, CA 95030
CONTRACT NUMBER:
DR JACQUES BESER
TITLE:
FLIGHT TEST DATA FILTERING AND SMOOTHING
TOPIC# 255 OFFICE: NAVAIR/NATC

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REDUCTION OF AIRCRAFT TRACKING DATA FOR PRECISE TRAJECTORY DETERMINATION REQUIRES SMOOTH DATA. IF THE TRUE TRAJECTORY HAS ABRUPT CHANGES IN IT, CONVENTIONAL POLYNOMIAL LEAST SQUARES TECHNIQUES WILL BE INADEQUATE TO MEET PRECISION REQUIREMENTS. FURTHERMORE, MANY TEST MISSIONS COULD SIGNIFICANTLY BENEFIT FROM REAL-TIME SOLUTIONS INSTEAD OF CURRENT BATCH PROCESSING. THIS PROPOSAL PRESENTS AN ADAPTIVE OPTIMAL ESTIMATION TECHNIQUE THAT CAN MEET THESE REQUIREMENTS. CONCEPTS TO RELIABLY HANDLE THE RESPONSE/STABILITY TRADEOFF IN AN ADAPTIVE REAL-TIME FILTER HAVE BEEN FORMULATED. THE APPROACH INCLUDES ADAPTATION OF BOTH PROCESS AND MEASUREMENT NOISE, AND USE OF NON-LINEAR STATE PROPAGATION MODELS. EXTENDED STATE ESTIMATION IS DISCUSSED FOR PARTICULAR APPLICATIONS REQUIRING OTHER INFORMATION OR FOR CASES WHERE TRACKING SENSORS POSSESS SIGNIFICANT, DYNAMIC ERRORS. POST-FLIGHT OPTIMAL SMOOTHING APPLICATIONS ARE DISCUSSED.

TECHNOLOGY INTEGRATION & DEV GP INC
ONE PROGRESS RD
BILLERICA, MA 01821
CONTRACT NUMBER:
NATHAN B HIGBIE
TITLE:
HELICOPTER VIBRATION MONITORING USING UNIFIED FAULT-ST ANALYSIS
TOPIC# 100 OFFICE: NAVAIR

VIBRATION MONITORING R&D HAS BEEN SIGNAL PROCESSING ORIENTED AND PROBLEMS ARISE BECAUSE TECHNIQUES DEVELOPED FOR ONE MACHINE ARE NOT TRANSFERABLE TO OTHERS. TIDG PROPOSES A UNIFIED APPROACH TO MONITORING R&D WHICH WILL USE MODELING AND DATA TO PREDICT FAULT SIGNATURES, USE CEPSTRAL AND OTHER FORMS OF PROCESSING TO REMOVE OR DEFINE THE MACHINE'S STRUCTURAL RESPONSE TO THE DEFECT, AND USE UNIQUE SENSOR AND NOISE REDUCTION CONCEPTS TO IMPROVE FAULT SIGNAL-TO-NOISE RATIO AT THE SENSOR. DETECTION ALGORITHMS, SIMILAR TO SONAR DETECTION PROCESSING, WILL THEN BE USED TO DETECT AND IDENTIFY FAULTS WHEN THEY OCCUR. PHASE I WILL INVESTIGATE THE FEASIBILITY OF THIS APPROACH BY PERFORMING AN ANALYSIS FOR A SPECIFIC GEARBOX. GEAR AND BEARING MODELS WILL BE USED TO PREDICT FAULT SIGNATURES. THE GEARBOX STRUCTURAL RESPONSE WILL BE MEASURED, AND THE APPLICABILITY OF RECENT

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MACHINERY STRUCTURAL RESPONSE RESEARCH WILL BE INVESTIGATED. METHODS FOR SIGNAL-TO-NOISE IMPROVEMENT WILL BE DEVISED AND INVESTIGATED. A SYSTEM INTEGRATION AND FEASIBILITY STUDY (BASED ON SONAR SYSTEM ANALYSIS TECHNIQUES) WILL THEN BE DONE. THE APPROACH HAS THE PROMISE OF HAVING WIDE APPLICATION TO VIBRATION MONITORING, SINCE THE RESULTS AND PRODCEDURES DERIVED FOR ONE GEARBOX WILL BE APPLICABLE TO MANY OTHERS; ONLY THE SPECIFIC GEARBOX PARAMETERS WILL CHANGE.

TETRA CORP
4905 HAWKINS NE
ALBUQUERQUE, NM 87109
CONTRACT NUMBER:
A E RODRIGUEZ
TITLE:
SEAWATER SPLIT TRANSFORMER COUPLING MODEL
TOPIC# 195 OFFICE: NUSC

IF A SPLIT TRANSFORMER IS EXPOSED TO SEA WATER, THE DEVICE MIGHT TRANSFER SIGNIFICANT AMOUNTS OF ENERGY TO THE SECONDARY EVEN IN THE SAFE POSITION. TETRA PROPOSES TO BUILD A COMPUTER MODEL OF THE COUPLING PROCESS WHICH WILL ACCOMMODATE EXTREMES OF TEMPERATURE, SALINITY AND CONTAMINANTS AND GEOMETRIES AND ORIENTATIONS. THE THEORETICAL APPROACH PROPOSED IS BASED ON CALCULATING THE MAGNETIZATION, CONDUCTANCE AND DIELECTRIC PROPERTIES OF THE WATER, BUILDING FROM PROPERTIES OF INDIVIDUAL SPECIES. THE SENSITIVITY OF THE RESULTS SHALL BE STUDIED USING A FIRST ORDER MODEL, WHICH SHALL BE VALIDATED THEORETICALLY AND EMPIRICALLY. THE EMPIRICAL TEST SHALL BE A LIMITED EXPERIMENT IN PHASE I. THEORETICALLY, THE REGIONS OF VALIDITY OF KEY ASSUMPTIONS AND APPROXIMATIONS SHALL BE ESTIMATED, LEADING TO RECOMMENDED IMPROVEMENTS FOR A PHASE II MODEL.

TEXAS RESEARCH INSTITUTE
9063 BEE CAVES RD
AUSTIN, TX 78733
CONTRACT NUMBER:
DR CECIL M TELLER
TITLE:
IMPROVED TRANSDUCER PRODUCTION TESTING FOR RUBBER-TO-M JOINTS
TOPIC# 68 OFFICE: NAVSEA

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THE OVERALL GOAL OF THIS RESEARCH IS TO DEVELOP AN INNOVATIVE NONDESTRUCTIVE (NONINVASIVE) INSPECTION TECHNIQUE FOR THE DETERMINATION OF THE INTEGRITY OF RUBBER-TO-METAL BONDS OF THE TYPE USED IN PRODUCTION SONAR TRANSDUCERS. THE PHASE I EFFORT WILL DEVELOP THE IMPEDANCE ANALYSIS TECHNIQUE THAT RELATES THE ELECTRICAL IMPEDANCE CHARACTERISTICS OF AN ULTRASONIC TRANSDUCER TO THE PROPERTIES OF A BONDED SAMPLE WITH WHICH IT IS IN CONTACT. PERFORMANCE OF THE TECHNIQUE WILL BE EVALUATED BY IT'S CAPABILITY TO DETECT AN UNBOND CONDITION IN WHICH THE RUBBER AND METAL ARE IN INTIMATE CONTACT. THEORETICAL WORK WILL CONSIDER THE ELECTRICAL EQUIVALENT CIRCUIT MODEL OF TRANSDUCER INCLUDING THE ACOUSTIC LOADING PRESENTED BY THE SAMPLE WITH WHICH IT IS IN CONTACT. EXPERIMENTAL WORK WILL INCLUDE DEVELOPMENT OF SUITABLE TRANSDUCERS AND ANALYSIS OF IMPEDANCE DATA USING INVERSE ACOUSTIC MODELING TECHNIQUES TO INFER MATERIAL CHARACTERISTICS RELATING TO THE BONDED AND UNBONDED CONDITION. A NUMBER OF CONTROLLED RUBBER-TO-METAL BONDED SAMPLES WILL BE MANUFACTURED AND INSPECTED TO DETERMINE THE SUITABILITY AND LIMITS OF PERFORMANCE OF THE PROPOSED METHOD.

THERMACORE INC
780 EDEN RD
LANCASTER, PA 17601
CONTRACT NUMBER:
NELSON J GERNERT
TITLE:
FLEXIBLE HEAT PIPE COLD PLATE
TOPIC# 191 OFFICE: NADC/NAVAIR

FEEDBACK POSITIONING AND CONTROL OF ONE FLIGHT CONTROL HYDRAULIC ACTUATOR REQUIRES DOZENS OF WIRES BETWEEN THE ACTUATOR AND FLIGHT CONTROL COMPUTER. IT IS DESIRABLE TO REDUCE THIS WIRE COUNT BY INCORPORATING FEEDBACK LOOP CLOSURE AND REDUNDANCY MANAGEMENT ELECTRONICS ON OR WITHIN THE FLIGHT CONTROL ACTUATOR. A RELIABLE COOLING METHOD WILL BE NEEDED TO OPERATE FLIGHT CRITICAL ELECTRONICS IN THIS ENVIRONMENT. THIS PROPOSAL DESCRIBES A PROGRAM TO DEVELOP A FLEXIBLE HEAT PIPE COLD PLATE FOR THIS APPLICIATION. THE FLIGHT CRITICAL ELECTRONICS WOULD BE MOUNTED ON A COLD PLATE. THE WASTE HEAT WOULD BE TRANSFERRED TO A HEAT SINK VIA A FLEXIBLE HEAT PIPE INTEGRAL WITH THE COLD PLATE. THE PROPOSED WORK PROGRAM IS BASED ON USING COLD

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PLATE AND FLEXIBLE HEAT PIPE TECHNOLOGY. IT COVERS DEFINITION OF REQUIREMENTS THROUGH ANALYSIS, FABRICATION, AND TEST OF DEMONSTRATION HARDWARE.

TMT/TTE JOINT VENTURE
15202 PIPELINE LN
HUNTINGTON BEACH, CA 92649
CONTRACT NUMBER:
JOHN F FLORY
TITLE:
SYNTHETIC LINE HARDWARE
TOPIC# 223 OFFICE: NCEL/NAVFAC

TERMINATIONS AND OTHER "HARDWARE" THAT ARE USED FOR ANCHORING, GRIPPING OR HANDLING SYNTHETIC FIBER LINES ARE AN ESSENTIAL ELEMENT IN THE OPERATIONAL SUCCESS OF THESE LINES. SIZE, WEIGHT, LACK OF ENGINEERING DATA AND QUESTIONABLE RELIABILITY OF CURRENT EQUIPMENT HAS RESULTED IN LESS THAN OPTIMUM UTILIZATION OF SYNTHETIC FIBER LINES. THE PROPERTIES OF SYNTHETIC LINES ARE HIGH STRENGTH, LOW WEIGHT, ELASTICITY, CORROSION RESISTANCE AND FLEXIBILITY ARE HIGHLY DESIRABLE FOR MANY MILITARY APPLICATIONS. CONSIDERABLE DEVELOPMENT POTENTIAL EXISTS FOR HARDWARE FOR THESE LINES SINCE ADAPTATION OF WIRE ROPE TECHNOLOGY HAS PROVED UNSATISFACTORY. THIS PROGRAM PROPOSES TO: GATHER AND QUANTIFY RELEVANT DATA FROM CURRENT OPERATIONS, CONDUCT A DESIGN FEASIBILITY STUDY, DEFINE HARDWARE FOR FUTURE DEVELOPMENT AND TO PRESENT A PLAN FOR THAT DEVELOPMENT. LIGHTWEIGHT COMPOSITE FIBER MATRIX STRUCTURES WILL BE EXTENSIVELY INVESTIGATED.

TS INFOSYSTEMS INC
4611-G ASSEMBLY DR
LANHAM, MD 20706
CONTRACT NUMBER:
DR WARREN A HOVIS JR
TITLE:
INFRARED ATMOSPHERIC TRANSMISSOMETER
TOPIC# 133 OFFICE: NSWC

THE PROPOSAL IS TO DEVELOP A SPECTRAL ATMOSPHERIC TRANSMISSOMETER TO

SUBMITTED BY

COVER THE SPECTRAL REGION FROM 1 TO 14 MICROMETERS THAT WILL OPERATE IN A MARINE ENVIRONMENT. THE PHASE I EFFORT WILL CONSIST OF REVIEW OF THE OFF THE SHELF OPTIONS FOR THE VARIOUS MAJOR COMPONENTS, SELECTION OF THE BEST SET TO MATCH THE NEED AND DESIGN OF THE SYSTEM. PRELIMINARY ANALYSIS INDICATES THAT A FLITER WEDGE SPECTROMETER, COUPLED WITH A HOT BLACK BODY AND A RETROREFLECTOR WOULD FILL THE REQUIREMENTS. THE MAJOR PROBLEM TO BE FACED IS SELECTION OF A WINDOW MATERIAL THAT WILL PROTECT THE OPTICAL SYSTEMS THAT CAN SURVIVE THE MARINE ENVIRONMENT WHILE GIVING REPRODUCIBLE RESULTS WITH A REASONABLE LEVEL MAINTENANCE. NEWLY DEVELOPED MATERIALS, SUCH AS CLEARTRAN, WILL BE EXAMINED FOR THIS REQUIREMENT.

UFI
545 MAIN ST - STE C2
MORRO BAY, CA 93442
CONTRACT NUMBER:
HARVE M HANISH
TITLE:
SEALINK - A MULTICHANNEL TELEMETRY SYSTEM TO MONITOR D
TOPIC# 13 OFFICE: ONT

BIO-TELEMETRY FROM PEOPLE IN AN UNDERSEA ENVIRONMENT IS CONSIDERABLY MORE DIFFICULT AND MORE COMPLEX THAN THE TASKS OF MONITORING MEN IN SPACE OR ON EARTH. THIS PROJECT ADDRESSES THESE DIFFICULTIES AND COMPLEXITIES. A PROTOTYPE MULTI-CHANNEL, UNDERWATER TELEMETRY SYSTEM WITH THE CAPACITY TO MONITOR 8 CHANNELS OF PHYSIOLOGICAL DATA FOR AT LEAST 8 HOURS FROM AN UNTETHERED COMBAT SWIMMER OPERATING AT A DEPTH OF UP TO 300 FEET HAS BEEN DESIGNED. THE MONITORING STATION MAY BE LOCATED UP TO 5 MILES AWAY FROM THE SITE OF ACTUAL DIVING OPERATIONS. THIS SYSTEM DESIGN ALSO PRESENTS THE CONCEPTS AND CONSIDERATIONS REQUIRED TO EXPAND THE SYSTEM CAPACITY TO ENABLE ACQUISITION, MONITORING AND DISPLAY OF DATA SIMULTANEOUSLY FROM UP TO 6 UNDERWATER SUBJECTS.

VANCE SYSTEMS INC
3901-V BONANZA BLVD
CHANTILLY, VA 22021
CONTRACT NUMBER:
JOHN A ZETT
TITLE:
ON-LINE SYSTEM AUTOMATED TEST EQUIPMENT
TOPIC# 126 OFFICE: NSWC

SUBMITTED BY

THIS PROPOSAL DEFINES THE DEVELOPMENT OF THE SYSTEM LEVEL AUTOMATION TEST EQUIPMENT (SLATE) FOR THE ON-LINE MAINTENANCE OF DISTRIBUTED PROCESSING SYSTEMS BASED ON LOCAL AREA NETWORKS (LANs). THE SLATE IS A STAND-ALONE SUBSYSTEM WHICH PROBES THE SYSTEM THROUGH A LAN. THE SLATE ASSISTS IN THE DETECTION AND ISOLATION OF FAULTS TO THE SUB-SYSTEM LEVEL. FAULT DETECTION IS ACHIEVED THROUGH NON-INTRUSIVE PERFORMANCE MONITORING, SYSTEM MESSAGE FLOW ANALYSIS AND/OR PERIODIC INTERACTION WITH THE SUBSYSTEMS. FAULT ISOLATION CAPABILITIES BEGIN WITH A SET OF COMMANDS AVAILABLE TO THE USER FOR INTERACTING WITH OTHER SUBSYSTEMS ON THE NETWORK. THE COMMANDS CAN BE EXECUTED INDIVIDUALLY OR GROUPED TOGETHER AS COMMAND SEQUENCES. THE SLATE RECORDS THE PROCEDURE AND COMMAND SEQUENCES USED TO ISOLATE A FAULT AND ALLOWS THE USER TO REVIEW, EDIT AND SAVE THE PROCEDURE ON COMPLETION. ONCE A BASE OF THESE DIAGNOSTIC ROUTINES FOR A SYSTEM HAS BEEN ESTABLISHED, THE DETECTION OF A FAULT BY THE SLATE CAN BE MAPPED INTO THE APPROPRIATE SET OF DIAGNOSTIC ROUTINES FOR AUTOMATIC FAULT ISOLATION AND REPORTING. THE ACHIEVEMENTS SCHEDULED FOR THE PHASE I ACTIVITIES OF THIS PROJECT INCLUDE DEVELOPING THE COMMANDS NECESSARY TO TRANSMIT AND RECEIVE ON THE LAN AND DOCUMENTING THE FULL CAPABILITIES OF THE SLATE TO BE DEVELOPED IN PHASE II.

VANTAGE CONSULTING & RESEARCH CORP
1001 MOLALLA AVE - STE 208
OREGON CITY, OR 97045
CONTRACT NUMBER:
RAYMOND O LIERE
TITLE:
AN INTELLIGENT ADAPTIVE AND EXTENSIBLE SGML TRANSFORME PARSER AND COMPILER
TOPIC# 95 OFFICE: NAVSUP

WE PROPOSE RESEARCHING THE CREATION OF A COMPUTER SOFTWARE SYSTEM THAT WOULD: TRANSFORM EXISTING FINISHED FORM TEXT FILES INTO SGML TAGGED TEXT FILES; GENERATE SGML TAGGED TEXT FILES FROM MANUALLY ENTERED TEXT; PARSE SGML TAGGED TEXT FILES TO DETERMINE WHETHER OR NOT THEY ARE SYNTACTICALLY CORRECT; COMPILE SCML TAGGED TEXT FILES INTO SGML TAGGED TEXT FILES HAVING FULLY QUALIFIED GENERIC IDENTIFIERS AND WITH MINIMIZATION REMOVED. MAJOR INNOVATIONS INCLUDE HAVING THE SYSTEM: STORE BOTH THE SGML RULES AND THE DOCUMENT TYPE DEFINITIONS

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IN A WAY THAT WOULD EASILY ALLOW ONE TO MODIFY THEM; DETERMINE HOW TO CONVERT INPUT TEXT INTO AN SGML TAGGED TEXT FILE, BASE ON INFORMATION OBTAINED FROM THE USER AND ON THE APPLICATION OF KNOWLEDGE THAT THE SYSTEM HAS ACQUIRED FROM THE INPUT TEXT ITSELF AND FROM PREVIOUS CONVERSION EXPERIENCES; ALLOW A WIDE VARIETY OF TYPES OF FINISHED FORM TEXT INPUT; ACCOMMODATE VARYING LEVELS OF USER EXPERTISE AND VARYING AMOUNTS OF AVAILABLE INFORMATION.

VECTOR MICROWAVE RESEARCH CORP
1150 S WASHINGTON ST - STE 300
ALEXANDRIA, VA 22314
CONTRACT NUMBER:
RONALD T CRABB
TITLE:
LOW COST ELECTRONIC WARFARE SYSTEMS FOR REMOTE OPERATE
TOPIC# 43 OFFICE: NAVSEA

EMPHASIS IS PLACED ON THE EW SYSTEM REQUIREMENTS FOR A REMOTELY OPERATED VEHICLE DESIGNED TO PROVIDE OFF-BOARD JAMMING PROTECTION FOR US NAVY SURFACE SHIPS. NOVEL ECM WAVEFORMS ARE SELECTED AND DESCRIBED WHICH (1) TAKE ADVANTAGE OF THE PRE-CURSOR GEOMETRY AVAILABLE, (2) REQUIRE MINIMUM SELF CONTAINED RECEIVER, PROCESSER, AND FREQUENCY SET-ON CAPABILITY, AND (3) ARE EFFECTIVE AGAINST THE MODERN RADAR THREAT--BOTH TARGETING AND ANTI-SHIP MISSILE HOMING. EFFECTIVE RADIATED POWER (ERP), FIELD OF VIEW (FOV), PRIME POWER CONSTRAINTS, AND OPERATING GEOMETRY REQUIREMENTS ARE ASSESSED. POTENTIAL OFF-BOARD PLATFORMS ARE IDENTIFIED. THE KEY TO SUCCESSFUL EW PROTECTION AGAINST MULTIPLE SIMULTANEOUS THREATS IS THE USE OF JAMMING GATES WITH RAPID FREQUENCY SET-ON METHODS TO COUNTER FREQUENCY AGILE THREATS. OVERLOAD PROBABILITIES AS A FUNCTION OF ENVIRONMENT AND ECM WAVEFORM PARAMETERS AND THE TRADES ARE PRESENTED. PSUEDO SYNCHRONOUS TIME-SHARED WAVEFORMS ARE DESCRIBED WHICH OFFER EXCELLENT PERFORMANCE AGAINST LEADING EDGE TRACKERS. THE NEED OF SEVERAL SYSTEM TRADES AMONG CONFLICTING REQUIREMENTS AND CONSTRAINTS IS ESTABLISHED. APPROXIMATELY 5 MAN-MONTHS OF EFFORT OVER A PERIOD OF 6 MONTHS IS PLANNED.

VECTOR MICROWAVE RESEARCH CORP
1150 S WASHINGTON ST - STE 300
ALEXANDRIA, VA 22314
CONTRACT NUMBER:
DOUGLAS ISRAEL
TITLE:
USE OF MILLIMETER WAVE TECHNOLOGY IN NAVAL SHIPBORNE R
APPLICATIONS
TOPIC# 72 OFFICE: NAVSEA

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POTENTIAL NAVAL SHIPBORNE MM WAVE APPLICATIONS ARE REVIEWED. EMPHASIS IS ON THE NEED TO COUNTER ANTI-SHIP MISSILE THREATS FOR WHICH PRESENT SYSTEMS MAY NOT BE EFFECTIVE, AND THE "SEA-SKIMMING" ANTI-SHIP MISSILE IS EXPECTED TO CONTINUE TO GENERATE DEMANDING SHIPBORNE FIRE CONTROL RADAR REQUIREMENTS. A COMBINATION OF VERY SHORT REACTION TIME, A SMALL RCS TARGET, AND "CLUTTER" POSES SIGNIFICANT RADAR DESIGN CHALLENGES. IN THE STUDY, BOTH U.S. AND FOREIGN MM WAVE RADARS IN USE WILL BE REVIEWED. THEIR SYSTEM AND TECHNOLOGY LIMITATIONS WILL BE IDENTIFIED AND AREAS FOR IMPROVEMENTS DEFINED. THE GENERIC PERFORMANCE OF MM WAVE RADARS WILL BE CALCULATED, TAKING INTO ACCOUNT THE ENVIRONMENTAL EFFECTS, SUCH AS ATMOSPHERIC LOSS, THE VOLUMETRIC SEARCH PROBLEM, HYDROMETEROR SCATTERING, AND THE RANGE OF RADAR PARAMETERS--TRANSMITTER POWER, NOISE FIGURE, COMPONENT LOSSES, ANTENNA PATTERN SIDELOBES, ETC. SPECIAL ATTENTION WILL BE GIVEN TO THE APPLICATION OF MONOPULSE RADAR TECHNIQUES. COHERENT SIGNAL PROCESSING, ALTHOUGH NOT CURRENTLY IN EXTENSIVE USE DUE TO TECHNOLOGY LIMITATIONS, WILL BE INCLUDED TO EXAMINE ANY ADVANTAGES IT MAY OFFER.

VENTANA SCIENCES INC
2811 NIMITZ BLVD
SAN DIEGO, CA 92106
CONTRACT NUMBER:
DR CHARLES N KATZ
TITLE:
AUTOMATED BROADBAND DETECTABILITY
TOPIC# 32 OFFICE: SPAWAR

THE PROPOSED EFFORTS ARE DIRECTED AT DEVELOPING AND APPLYING AN INNOVATIVE APPROACH TO AUTOMATIC DETECTION, CLASSIFICATION, AND LOCALIZATION FOR DISTRIBUTED SENSOR FIELDS IN CONTACT WITH PASSIVELY RADIATED ACOUSTIC SIGNALS FROM PLATFORMS OF INTEREST TO NAVAL SURVEILLANCE. THE APPROACH EXPLOITS THE NATURAL PHYSICAL PHENOMENA WHICH GOVERN ACOUSTIC SIGNAL PROPAGATION AND BOUNDARY INTERACTION IS ORDER TO AUTOMATICALLY FORM CORRELOGRAM SIGNATURES WHICH SIMULTANEOUSLY PROVIDE THE BASIS FOR AUTOMATIC DECLARATION OF DETECTION AND ESTIMATION OF CONTACT DEPTH AND RANGE. THE APPROACH IS NOVEL INSOFAR AS IT ATTEMPTS TO CROSS-CORRELATE TWO-DIMENSIONAL FILTERED ENHANCED CORRELOGRAMS DEVELOPED FROM THE GENIUNE SIGNAL DATA WITH A SET OF PREDICTED CORRELOGRAM SIGNATURE TEMPLATES WHICH CHARACTERIZE ALL

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FEASIBLE CONTACT-SENSOR SYSTEM SCENARIOS FOR THE PREVAILING ENVIRONMENTAL CONDITIONS AND KNOWN REGIONAL BATHYMETRY. CORRELOGRAM FEATURES ARE CAUSED BY SIGNAL ARRIVAL PATH DIVERSITY WHICH, FOR A GIVEN TARGET STATE ARE ABSOLUTELY DETERMINED BY THE NATURAL PHENOMENA GOVERNING SOUND TRANSMISSION AND BOUNDARY INTERACTIONS.

VIA-SAT INC
6120 PASEO DEL NORTE - J-2
CARLSBAD, CA 92008
CONTRACT NUMBER:
MARK MILLER
TITLE:
A COMPACT COMMUNICATIONS ENVIRONMENT SIMULATOR
TOPIC# 254 OFFICE: NAVAIR/NATC

THIS PROPOSAL DESCRIBES AN INNOVATIVE APPROACH TO SIMULATING LARGE NUMBERS OF RF SIGNALS COVERING FREQUENCY BANDS RANGING FROM VLF TO MICROWAVE. THE SIMULATED RF ENVIRONMENT CONSISTS OF HUNDREDS OR THOUSANDS OF INDEPENDENT USERS ENCOMPASSING A LARGE NUMBER OF DIFFERENT MODULATION TYPES (EG. AM OR FM VOICE, SECURE DIGITAL VOICE OR DATA). THE PROPOSED APPROACH IS BASED ON A DIGITAL PARALLEL PROGRAMMABLE MODULATOR (PPM) USED WITH RF SIGNAL GENERATION EQUIPMENT. THE PROPOSED SIMULATOR WOULD OCCUPY LESS THAN ONE STANDARD 19" EQUIPMENT RACK. THE SIMULATOR IS DIRECTLY APPLICABLE TO TESTING OF TACTICAL COMMUNICATIONS, EW, ESM, ECM OR ECCM EQUIPMENT. IT WOULD ALSO BE USEFUL IN TESTING MILITARY OR COMMERCIAL FDMA (FREQUENCY DIVISION MULTIPLE ACCESS) SATELLITE SYSTEMS OR COMMERCIAL MOBILE OR CELLULAR RADIO NETWORKS OR IN FAST PROTOTYPING OF COMPLEX OR HIGH SPEED MODULATIONS. THE PROPOSED PHASE I PROGRAM OBJECTIVES INCLUDE GENERATION OF A FUNCTIONAL PERFORMANCE SPECIFICATION DEFINING PARAMETERS SUCH AS THE NUMBER AND TYPES OF SIMULATED USERS, INDIVIDUAL MODULATION SPECIFICATIONS, POWER LEVELS AND INTERFACES AND A STRAWMAN HARDWARE/SOFTWARE DESIGN USING THE PROPOSED CONCEPT. THE RESULTING FINAL REPORT WILL PROVIDE A BASIS FOR SPECIFICATION AND COST ESTIMATION FOR A PHASE II EDM PROGRAM.

VIA-SAT INC
6120 PASEO DEL NORTE - J2
CARLSBAD, CA 92008
CONTRACT NUMBER:
MARK DANKBERG
TITLE:
DEVELOPMENT OF COVERT COMMUNICATIONS APPLIQUE
TOPIC# 39 OFFICE: SPAWAR

SUBMITTED BY

THIS PROPOSAL DESCRIBES AN INVESTIGATION INTO DESIGN APPROACHES FOR A COVERT COMMUNICATIONS APPLIQUE FOR EXISTING NAVY VHF AND UHF RADIOS SUCH AS THE PRC-117, WSC-3 AND ARC-182. THE PROPOSAL DESCRIBES THE POTENTIAL REDUCTIONS IN DETECTABILITY DUE TO DECREASED TRANSMIT POWER OR DECREASED TRANSMIT POWER SPECTRAL DENSITY FOR POWER CONTROL AND SPREAD SPECTRUM APPROACHES. THE PROPOSAL ALSO CONSIDERS SOME OF THE TOP LEVEL DESIGN ISSUES IN IMPLEMENTING POWER CONTROL AND FEEDBACK CONTROL SYSTEMS, AND OFFERS CONCEPTUAL TRADE-OFFS BETWEEN COMPLEXITY AND PERFORMANCE GAINS. PHASE I PROGRAM OBJECTIVES INCLUDE DEFINITION OF COVERT PERFORMANCE METRICS, DEFINITION OF PLATFORM AND PROPAGATION CONSTRAINTS, IDENTIFICATION OF CANDIDATE APPROACHES, PERFORMANCE EVALUATION AGAINST THE DEFINED METRICS, TOP LEVEL DESIGN, EVALUATION AGAINST ECONOMIC CONSTRAINTS AND PREPARATION OF A FINAL REPORT. IF SUCCESSFUL, THE PROGRAM WOULD LEAD TO A PHASE II HARDWARE MODEL.

VISTA CONTROLS CORP
27825 FREMONT CT
VALENCIA, CA 91355
CONTRACT NUMBER: M00027-87-C-0080
RICHARD COPRA
TITLE:
TRANSLATION OF JAMS SOFTWARE FROM C LANGUAGE TO ADA LA
TOPIC# 25 OFFICE: MARINE CORPS

THIS PROPOSAL IS DIRECTED TOWARDS THE EFFORT FOR CONVERSION OF JINTACCS AUTOMATED MESSAGE SOFTWARE (JAMS) FROM THE C PROGRAMMING LANGUAGE TO THE DOD DIRECTED ADA LANGUAGE. THE EFFORT WILL CONSIST OF A LANGUAGE CONSTRUCT COMPATIBILITY ANALYSIS, AND ANALYSIS OF OTHER POTENTIAL PROBLEMS IN THE CONVERSION SUCH AS NUMERICAL ACCURACY AND OPERATING SYSTEM DIFFERENCES, THE STUDY OF PARSING ALGORITHMS FOR POSSIBLE AUTOMATION OF TRANSLATION, AND A METHOD FOR VERIFICATION OF THE RESULTING ADA PROGRAM. A CONCERN FOR THE VERIFICATION OF THE ADA PROGRAM WILL HAVE RAMIFICATIONS IN ALL PHASES OF THE EFFORT. ALL RESOLUTION OF LANGUAGE DIFFERENCES WILL BE DONE IN SUCH A MANNER SO AS TO ALLOW TECHNIQUES TO BE USED IN THE VALIDATION OF THE FUNCTIONAL EQUIVALENCE OF THE ADA-JAMS PROGRAM.

VISTA RESEARCH INC
PO BOX 51820 - 3600 W BAYSHORE RD
PALO ALTO, CA 51820
CONTRACT NUMBER: N60530-87-C-0492
DR ALAN A BURNS
TITLE:
LASER-DIODE LINEAR MEASURE SENSOR FOR DYNAMIC/HOSTILE
TOPIC# 177 OFFICE: NWC/SSPO

SUBMITTED BY

THE PROPOSED NON-INTRUSIVE SENSOR IS AN OPTICAL ANALOG OF A RADAR ALTIMETER. THE CARRIED IS AN INFRARED BEAM GENERATED BY A LASER DIODE, WHICH IS MODULATED BY A MICROWAVE SIGNAL. A COMPARISON BETWEEN THE PHASE OF THE RF MODULATING SIGNAL AND THAT OF THE DETECTED OPTICAL SIGNAL PROVIDES THE DISTANCE MEASUREMENT. OPERATION IN THE INFRAREDMINIMIZES THE EFFECTS OF PARTICULATES ON OPTICAL PROPAGATION, AND THE MINOR EFFECT OF GASES ON THE REFRACTIVE INDEX MINIMIZES ERRORS FROM TEMPERATURE AND PRESSURE FLUCTUATIONS.

WADDAN SYSTEMS
6585 NEDDY AVE
CANOGA PARK, CA 91307
CONTRACT NUMBER:
DR MAHENDRA SINGH
TITLE:
LOW COST SILICON ACCELEROMETER
TOPIC# 169 OFFICE: NWC/NAVAIR

RESEARCH TO DESIGN AND DEVELOP A LOW COST INERTIAL GRADE SILICON ACCELEROMETER IS PROPOSED HERE. THE MAIN OBJECTIVE OF THE EFFORT IS TO SHOW THAT IT IS POSSIBLE TO BUILD AN ACCELEROMETER ON A SINGLE CRYSTAL SILICON CHIP, CAPABLE OF HANDLING MID-COURSE GUIDANCE REQUIREMENTS OF A MISSILE. A SILICON WAFER IS CHEMICALLY ETCHED THROUGH A MULTI-STAGE PROCESS TO YIELD TORSIONALLY FLEXIBLE HINGE FLEXURES SUPPORTING A PROOF MASS. THE ACCELEROMETER UTILIZES A CAPACITIVE PICK-OFF TO MEASURE THE DEFLECTION OF THE PROOF MASS. THE PICK-OFF SIGNAL IS AMPLIFIED AND FED TO RESTORING CONTROLLER WHICH DRIVES THE ELECTROSTATIC FORCER TO COUNTER THE INERTIAL FORCE ACTING ON THE PROOF MASS. THE SIGNAL DIFFERENTIAL VOLTAGE INPUT TO THE FORCER IS A DIRECT MEASURE OF THE APPLIED ACCELERATION. A DETAILED DESIGN ANALYSIS WILL BE PERFORMED BEFORE BUILDING AN ENGINEERING MODEL OF THE ACCELEROMETER.

WAGNER D H ASSOCS
1270 OAKMEAD PKWY - STE 314
SUNNYVALE, CA 94086
CONTRACT NUMBER:
DR JAMES R WEISINGER
TITLE:
DEVELOPING SEARCH PLANNING METHODS FOR OPTIMIZING ASYM DETECTION PERFORMANCE
TOPIC# 47 OFFICE: NAVSEA

SUBMITTED BY

THIS PROPOSAL ADDRESSES THE PROBLEM OF SEARCH PLANNING FOR ASYMMETRICAL DETECTION PERFORMANCE THROUGH A GENERALIZATION OF THE CONCEPT OF SWEPT AREA TO A "SWEPT AREA DISTRIBUTION." IN THIS APPROACH, SEARCH EFFECTIVENESS IS NOT MODELED BY A SINGLE NUMBER, SWEPT AREA, BUT RATHER BY A DISTRIBUTION THAT MEASURES THE LOCAL SEARCH EFFORT AT EACH POINT. THE INTEGRAL OF THE SWEPT AREA DISTRIBUTION IS THE USUAL SWEPT AREA. THIS APPROACH ALLOWS ASYMMETRY IN BOTH DEPTH AND DIRECTION TO BE MODELED. THE PROPOSED WORK HAS THREE MAIN OBJECTIVES: DETECTION MODELING--TO DEVELOP A SIMPLE BUT ACCURATE MODEL FOR ASYMMETRIC DETECTION PERFORMANCE. SEARCH PLANNING METHODOLOGY--TO GENERALIZE THE STANDARD SWEPT AREA SEARCH PLANNING TOOLS-USING THE SWEPT AREA DISTRIBUTION. TEST BED--TO CONSTRUCT A DEMONSTRATION TEST BED TO EVALUATE THE TACTICAL UTILITY AND TO DEMONSTRATE THE COMPUTATIONAL FEASIBILITY OF THE PROPOSED APPROACH. TAKEN TOGETHER, THESE THREE OBJECTIVES SHOULD PROVIDE A CLEAR DEMONSTRATION OF THE FEASIBILITY OF EMPLOYING THE SWEPT AREA DISTRIBUTION CONCEPT IN ASW SEARCH PLANNING.

WAGNER D H ASSOCS
STATION SQUARE ONE
PAOLI, PA 19301
CONTRACT NUMBER:
DR BARRY BELKIN
TITLE:
STATISTICAL MODELS FOR ATTRIBUTED-BASED TRACK CORRELAT
CLASSIFICATION
TOPIC# 167 OFFICE: JCMPO

WE ADDRESS THE NEED TO INTEGRATE ATTRIBUTES INTO ALGORITHMS USED TO TRACK AND CORRELATE TARGET CONTACTS. EXISTING SYSTEMS ARE GENERALLY BASED ON OBSERVATIONS OF TARGET KINETICS. WE PROPOSE TO DEVELOP DURING PHASE I AN ALGORITHM FOR CORRELATION AND CLASSIFICATION OF SURFACE CONTACTS IN WHICH THE TREATMENT OF SELECTED TARGET ATTRIBUTES IS FULLY INTEGRATED WITH THE TREATMENT OF TARGET POSITION AND VELOCITY. THIS ALGORITHM WILL BE BASED ON MATCH, A SYSTEM PREVIOUSLY DEVELOPED BY THIS FIRM FOR TRACKING MULTIPLE TARGETS USING POSITION AND ELINT OBSERVATIONS. MOST OF OUR EFFORT DURING PHASE I WILL BE DEVELOPING PRACTICAL STATISTICAL MODELS FOR RELEVANT ATTRIBUTES: ELINT, CALL SIGNS, SONAR-RELATED ATTRIBUTES, AND IMPERFECTLY REPORTED TARGET

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NAMES AND TYPES. OUR PROPOSAL DESCRIBES A UNIFIED FRAMEWORK FOR ATTRIBUTE MODELING BASED ON THE STATISTICAL THEORY OF CONJUGATE PRIOR DISTRIBUTIONS, WHICH WE HAVE USED SUCCESSFULLY FOR ATTRIBUTE-BASED CORRELATION IN OTHER CONTEXTS. IN PHASE II WE HOPE TO USE THE NEWLY DEVELOPED ATTRIBUTE MODELS AS A BASIS FOR IMPROVEMENTS IN AN OPERATIONAL NAVY SYSTEM AND TO INVESTIGATE, WITHIN THE CONTEXT, THE POSSIBLE USE OF AN EXPERT SYSTEM TO INTEGRATE CORRELATION WITH TARGET CLASSIFICATION.

WAGNER D H ASSOCS INC
27 W QUEENS WY - STE 301
HAMPTON, VA 23669
CONTRACT NUMBER:
DR ROBERT H OVERTON
TITLE:
FACTOR ANALYSIS AND ALGORITHM DEVELOPMENT FOR COORDINA
PLATFORM ANTI-SHIP CRUISE MISSILE ENGAGEMENT
TOPIC# 162 OFFICE: JCMPO

THE PROPOSED STUDY IS AN INITIAL QUANTITATIVE INVESTIGATION OF THE PROBLEMS AND BENEFITS INHERENT IN COORDINATED CRUISE MISSILE ATTACKS LAUNCHED BY MULTIPLE NAVY PLATFORMS AGAINST MULTIPLE DEFENDERS. THIS RESEARCH WILL IDENTIFY AND BOUND THE SYSTEM-LEVEL CONSTRAINTS FOR SUCCESSFUL COORDINATION, SELECT ALGORITHMS FOR OPTIMIZATION OF THE ATTACK WITHIN THOSE CONSTRAINTS, AND EXAMINE THESE ALGORITHMS FOR FEASIBILITY OF INCORPORATION INTO CRUISE MISSILE WEAPONS SYSTEMS. THE APPROACH IS AN EXTENSION OF TECHNIQUES USED BY THE PROPOSERS IN THE DEVELOPMENT OF CURRENT NAVY HARPOON AND TOMAHAWK EMPLOYMENT DOCTRINE. IT COMBINES QUANTITATIVE MATHEMATICAL ANALYSIS OF THE PARAMETERS INVOLVED UNDER VARIOUS SIMPLIFYING ASSUMPTIONS WITH A COMPLETE MODELING OF REPRESENTATIVE SCENARIOS WHICH REFLECT THE FULL COMPLEXITY OF THE PROBLEM. THIS MODELING WILL BE CARRIED OUT USING A MODIFICATION OF THE GENERALIZED ANTI-SHIP CRUISE MISSILE ENGAGEMENT MODULE DEVELOPED BY THE PROPOSERS FROM THE ENGAGEMENT MODULE OF THE SASHEM PROGRAM. PART OF THE PHASE I EFFORT WILL BE TO REVIEW THE MATHEMATICAL MODELS UNDERLYING THIS PROGRAM AND TO CERTIFY THE PROGRAM'S COMPLIANCE WITH THOSE MODULES. THIS STUDY PREPARES FOR A PHASE II PROJECT IN WHICH A COMPLETE PARAMETRIC MODEL OF ENGAGEMENT CONSTRAINTS IS DEVELOPED, AND PROTOTYPE DECISION AIDS TO DETERMINE

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COORDINATION FEASIBILITY AND OPTIMIZE SUCCESS WILL BE DEVELOPED.

WESTERN FILAMENT INC
4680 SAN FERNANDO RD
GLENDALE, CA 91204
CONTRACT NUMBER:
LURK WRIGHT
TITLE:
SONOBUOY CABLES OF HIGH STRENGTH SPECTRA MATERIALS
TOPIC# 192 OFFICE: NADC/NAVAIR

THERE IS A NAVY REQUIREMENT FOR STRONGER AND LIGHTER WEIGHT ASW SONOBUOY CABLES. THE PURPOSE OF THIS STUDY IS TO EVALUATE THE USE OF HIGH STRENGTH POLYETHYLENE MATERIRALS SPECTRA 900 AND SPECTRA 1000 AS THE STRENGTH MEMBER OF THE CABLES IN ORDER TO ACHIEVE THAT GOAL. THE BENCHMARK CABLE FOR THIS STUDY WILL BE CONSTRUCTED AS DESCRIBED IN THE SOLICITATION (DETAILS DESCRIBED IN REPORT NO. NADC-74221-20, "INVESTIGATION OF KELVAR FIBER CABLES FOR USE IN ASW SONOBUOYS" BY J. BRETT AND R. HOLLER, DATED JANUARY 20, 1975). THIS STUDY WILL EVALUATE THE PHYSICAL PROPERTIES OF SPECTRA 900 AND 1000 FOR THEIR APPLICATION TO SONOBUOY CABLES AND MAXIMIZE THE TEXTILE YARN PROPERTIES SUCH AS TENACITY, TOTAL DENIER, FILAMENT DENIER, TWIST, ELONGATION, AND MODULUS. OUR STUDY WILL ALSO INVESTIGATE THE PROPER PROCESSING CONDITIONS SUCH AS TWISTER SPINDLE SPEED AND RING TRAVELER MATERIALS WHICH IF NOT CORRECT WILL DAMAGE YARN AND REDUCE STRENGTH. THE SECOND PART WILL PRODUCE VARIOUS BRAIDED AND SERVED CANDIDATES FROM EACH MATERIAL VARYING THE CONSTRUCTION PARAMETERS SUCH AS TYPE OF BRAID, NUMBER OF CARRIERS, YARN DENIER, DENIER PER CARRIER, BRAID ANGLE, NUMBER OF ENDS, DENIER OF ENDS AND LAY ANGLE TO SELECT THE FINAL CANDIDATES FOR CABLE DESIGN AND CONSTRUCTION. THESE FINAL DESIGNS WILL ADDRESS THE TWO NAVAL REQUIREMENTS: 1) CABLES OF GREATER STRENGTH WITH EQUAL DIAMETER; AND 2) CALBES OF EQUAL STRENGTH WITH SMALLER DIAMETER. THE ELECTRICAL INTEGRITY OF THE CABLE WILL BE TESTED AND MAINTAINED.

WESTERN INSTRUMENT CORP
4050 MARKET ST
VENTURA, CA 93003
CONTRACT NUMBER: M00027-87-C-0067
WAYNE TAUSIG
TITLE:
FIBER OPTIC CABLE RECOVERY SYSTEM
TOPIC# 26 OFFICE: MARINE CORPS

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THE GOAL OF THIS PROJECT IS TO GENERATE A FEASIBLE DESIGN FOR A SYSTEM THAT WILL EXPEDIENTLY RECOVER SMALL-DIAMETER, FIBER-OPTIC, LAND-DEPLOYED CABLE. THIS PROJECT ALSO INCLUDES THE DEVELOPMENT OF THE CONCEPT DESIGN FOR THE CABLE-RECOVERY SYSTEM WITH SUPPORT ANALYSIS TO SUPPORT THE FEASIBILITY DESIGN. THE DESIGN WILL PROVIDE DEFINITION AND SPECIFICATION OF ALL SENSORS, CONTROLS, AND MECHANICAL COMPONENTS. FOR THIS PROJECT, WE PROPOSE TO USE STATE-OF-THE-ART OCEAN SYSTEM TECHNOLOGY DEVELOPED BY WESTERN FOR THE HANDLING AND RECOVERY OF SMALL-DIAMETER, FIBER-OPTIC CABLE IN THE DEEP OCEAN. AS A BY-PRODUCT OF THIS PROJECT, WE WILL GAIN A SPECIFIC UNDERSTANDING OF THE INTER-RELATIONSHIP BETWEEN THE RECOVERY, RE-SPOOLING, AND PAY-OUT SYSTEMS. THIS PROPOSAL IS THE FIRST PHASE OF A LARGE UNDERTAKING WHICH INCLUDES FABRICATING A PROTOTYPE FOR A CABLE-RECOVERY SYSTEM BASED ON THIS DESIGN, AND THEN, DEMONSTRATING THE VALIDITY OF THE DESIGN.

WOODSIDE DESIGN ASSOCS INC
654 BAIR ISLAND RD - STE 206
REDWOOD CITY, CA 94063
CONTRACT NUMBER:
STEVEN G KITCHEN
TITLE:
VOICE ACTUATED/PHONETIC RECOGNITION MICROCOMPUTER INPU
TOPIC# 90 OFFICE: NAVSUP

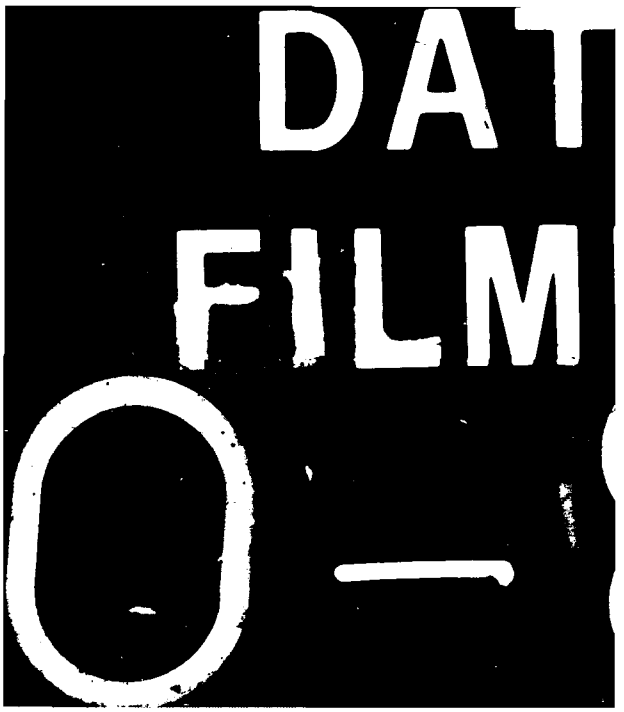
UTILIZING TECHNOLOGY WHICH EXISTS IN-HOUSE, WOODSIDE DESIGN ASSOCIATES, INC. (WDA) WILL COMBINE SPEECH RECOGNITION AND SPEECH SYNTHESIS TECHNOLOGIES INTO A COMPACT DATA INPUT DEVICE CAPABLE OF BEING MOUNTED ON A HARD HAT OR INTO A HAND-HELD UNIT. THIS TECHNOLOGY, WHICH HAS BEEN TESTED BY AN INDEPENDENT LAB UNDER A DEVELOPMENT CONTRACT FROM McDONNELL DOUGLAS CORPORATION, CONSISTENTLY WITHSTANDS A 0 dB SIGNAL-TO-NOISE RATIO. NOT RELIANT UPON THE INDUSTRY STANDARD OF MARKOVIAN PATTERN MATCHING, IT WILL TOLERATE BOTH HIGH LEVEL AMBIENT NOISE AND INTERMITTENT NOISE. ADDITIONALLY, ALL BUT THE MOST SEVERE REGIONAL ACCENTS CAN BE RECOGNIZED AND FACE MASE MUFFLEING, VOCAL CHANGES DUE TO STRESS AND THE COMMON COLD WILL REMAIN TRANSPARENT. THE SYSTEM IS TRULY SPEAKER INDEPENDENT, ACCEPTS CONTINUOUS SPEECH, RESPONDS IN REAL-TIME AND, FOR THIS APPLICATION, WILL BE CAPABLE OF A 100 WORD VOCABULARY. FORMATTING TRANSLATED DATA AND RS-232 INTERFACE ARE CON-

SUBMITTED BY

SIDERED STANDARD. THE SYNTHESIS TECHNOLOGY WILL PROVIDE VERIFICATION WITH A REALISTIC "HUMAN" SOUNDING VOICE. WELL VERSED ...

NAVY

TOTAL NUMBER OF AWARDS: 286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